INDUSTRIAL USES OF AGRICULTURAL PRODUCTS

UNIVERSITY
OF MICHIGAN
SEP 19 1956
MAIN
READING ROOM

HEARING

BEFORE A

SUBCOMMITTEE OF THE COMMITTEE ON AGRICULTURE AND FORESTRY UNITED STATES SENATE

EIGHTY-FOURTH CONGRESS

SECOND SESSION

ON

S. 3503

A BILL TO PROVIDE FOR A SCIENTIFIC STUDY AND RESEARCH PROGRAM FOR THE PURPOSE OF DEVELOPING INCREASED AND ADDITIONAL INDUSTRIAL USES OF AGRICULTURAL PRODUCTS SO AS TO REDUCE SURPLUSES OF SUCH PRODUCTS AND TO INCREASE THE INCOME OF FARMERS, AND FOR OTHER PURPOSES

JULY 6, 1956

Printed for the use of the Committee on Agriculture and Forestry

UNITED STATES
GOVERNMENT PRINTING OFFICE
81045 WASHINGTON : 1956

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INDUSTRIAL USES OF AGRICULTURAL PRODUCTS

FRIDAY, JULY 6, 1956

UNITED STATES SENATE,
SUBCOMMITTEE ON AGRICULTURAL RESEARCH AND
GENERAL LEGISLATION, OF THE
COMMITTEE ON AGRICULTURE AND FORESTRY,
Washington, D. C.

The subcommittee met, pursuant to notice, at 10 a. m., in room 324, Senate Office Building, Senator Earle C. Clements presiding.

Present: Senator Clements.

Also present: Senators Scott and Capehart.

Senator CLEMENTS. The committee will come to order.

The subcommittee is meeting this morning to consider S. 3503, a bill introduced by Senator Capehart for himself and for a number of other Members of the Senate, Senators Beall, Bender, Bricker, Butler, Carlson, Case of South Dakota, Dirksen, Dworshak, Flanders, Hruska, Ives, Jenner, Martin of Pennsylvania, Mundt, Payne, Potter, Schoeppel, Smith of New Jersey, Welker, Young, Case, Bush, Hickenlooper, Martin, Barrett, Thye, Purtell, Cotton, Allott, Smith of Maine, Bridges, Kuchel, and McCarthy.

This is a bill to provide for a scientific study and research program for the purpose of developing increased and additional industrial uses of agricultural products so as to reduce surpluses of such products and to increase the income of farmers, and for other purposes.

(S. 3503 is as follows:)

[S. 3503, 84th Cong., 2d sess.]

A BILL To provide for a scientific study and research program for the purpose of developing increased and additional industrial uses of agricultural products so as to reduce surpluses of such products and to increase the income of farmers, and for other purposes

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

DECLARATIONS AND FINDINGS

SECTION 1. The Congress of the United States hereby makes the following declarations and findings concerning the development of new and additional industrial uses for agricultural products:

(a) Current productivity of farms in the United States is substantially in excess of current markets for their products at price levels which provide fair and substantial income to farmers.

(b) National defense and the security interests of the United States require increasing and expanding agricultural productivity to meet possible emergency needs of the United States and its allies, which productivity cannot be achieved or maintained at depressed farm prices resulting from overproduction or with acreage curtailments to avoid overproduction.

(c) It is in the national interest of the United States to increase the level of farm income in order that farmers may continue to share to a greater degree in the general prosperity of the Nation.

(d) No program has been developed, and none can be foreseen, that can successfully shrink farm production for an extended period of time; but research programs provide known means potentially to increase substantially the industrial uses of agricultural products and thereby to achieve farm prosperity based in full, rather than curtailed, production.

(e) Research facilities, both private and public, including those of land-grant colleges and universities, can and should be utilized for an all-out attack on the development of increased and additional industrial uses of agricultural products to enlarge opportunities for increased production by farmers and to reduce Government costs for the acquisition, storage and ultimate disposition of agricultural commodities which are now a substantial financial burden to the Government.

(f) The cost to the United States of such a research program may be expected to be more than offset by increased tax revenues resulting from increased earnings of both farmers and those who sell goods, wares, and merchandise to farmers, as well as by savings to the United States in costs of current agricultural assistance programs.

PURPOSES

SEC. 2. The purposes of this Act are to find and develop through research, sponsored and financed by the United States, new industrial uses, and increased use under existing processes, of agricultural products.

ADMINISTRATION CREATED

SEC. 3. There is hereby created in the executive branch of the Government an Industrial Agricultural Products Administration (hereinafter referred to as the Administration), in which is vested the duties, powers, and responsibilities hereafter set out in this Act. Such powers, duties, and responsibilities of the Administration shall be vested in an Administrator, who shall be appointed by the President, by and with the advice and consent of the Senate, and who shall serve during the pleasure of the President. The Administrator shall receive compensation at the rate of $22,500 per annum.

DUTIES, POWERS, AND RESPONSIBILITIES OF THE ADMINISTRATION

SEC. 4. The Administration shall conduct research, both scientific and chemical, make field studies, conduct both laboratory and field experiments, test production procedures on a commercial basis, maintain and expand pilot plants whenever necessary, maintain and operate manufacturing facilities where necessary to prove the commercial feasibility of volume production, and otherwise promote the finding, development, and commercial use of new, increased, extended, and perfected processes, techniques, and programs for industrial uses of greater quantities of agricultural products.

POWERS OF THE ADMINISTRATION AND THE ADMINISTRATOR

SEC. 5. The Administration is authorized to:

(a) Utilize such existing facilities of the United States, and such trained personnel employed by the United States, as the President finds can feasibly be transferred to the Administration for carrying out the purposes of this Act. The President is hereby authorized to (1) transfer any such facility, facilities, or personnel to the Administration, or to (2) make any such facility, facilities, or personnel available to the Administration for carrying out the purposes of this Act.

(b) Build, purchase, or lease plant facilities, or necessary equipment, suitable for research, pilot plant, manufacturing or other needs of the Administration in carrying out the purposes of this Act.

(c) Employ such personnel as may be necessary to carry out the purposes of Act; and all technical or scientific employees engaged for research by the Administration shall be exempt from the civil service laws and regulations.

(d) Employ or retain on a contract basis individuals, firms, institutions, and organizations, public and private, including land-grant colleges and universities, to conduct research programs for the Administration pursuant to this Act.

SEC. 6. The Administration is authorized to pay incentive awards to private citizens for suitable and acceptable suggestions to implement the program established by this Act, such payments to be made in accordance with previously published rules stating the amounts of, criteria for determining, and subjects of, such awards.

SEC. 7. The Administrator is authorized to appoint Industry Advisory Committees and to employ consultants without compensation or at rates of compensation not to exceed $50 per diem.

SEC. 8. The Administration may make grants to accredited schools, colleges, and universities for fellowships and scholarships in research for the purposes of this Act.

INDUSTRIAL AGRICULTURAL PRODUCTS AGENCY CREATED

SEC. 9. There is hereby created in the Department of Agriculture an Industrial Agricultural Products Agency (hereinafter referred to as the "Agency"). The duties, obligations, and responsibilities of the Agency shall be carried out by and under the direction of the Secretary of Agriculture.

DUTIES AND RESPONSIBILITIES OF THE AGENCY

SEC. 10. Under the delegations, directives, and policy determinations of the Administrator, the Agency shall carry out all of the duties, obligations, and responsibilities imposed upon the Administration by this Act, including the making of research contracts, employment of personnel, contracts for the construction, purchase, lease, or other acquisitions of real or personal property, and the maintenance of all records, files, studies and other data undertaken pursuant to this Act. Notwithstanding any other provisions of this Act, the Administrator may delegate any power given him hereunder to the Agency, and he may control, supervise, and direct all Agency action permitted by law under this Act.

SEC. 11. The Administrator shall report semiannually to the Congress progress on research programs undertaken pursuant to this Act to find and develop new and increased industrial uses for agricultural products.

SEC. 12. The Agency may license, at a fair and reasonable royalty, any person, firm, or corporation to use any process developed by the Agency or to make and sell under any patent, or application for patent of the Agency. Such royalties shall be based upon fair compensation to the Government for its investment and shall be nondiscriminatory. Whenever the Administrator finds it in the public interest to do so, he may grant royalty-free licenses for processes developed under this Act, including the right to make and sell under any patent or application for patent of the Agency.

APPROPRIATIONS

SEC. 13. There is hereby authorized to be appropriated to the Department of Agriculture, for the Industrial Agricultural Products Agency, the sum of $100,000,000 for the fiscal year beginning July 1, 1956, and the same amount annually thereafter. There shall be paid out of such appropriations the salary of the Administrator as well as all other expenses of his office. The President is authorized to transfer to the Agency $1,000,000 out of unexpended Agricultural Department funds to initiate promply this program following the enactment of this Act for and during the fiscal year ending June 30, 1956.

Senator CLEMENTS. There are a number of Members of the Senate who have forwarded to the committee or the committee staff letters or statements with reference to their viewpoint in connection with this legislation that should, following the inclusion of the bill itself, be placed in the record.

The first one is from Senator Dirksen, of Illinois; the next one from Senator Welker, of Idaho; a statement from Senator Francis Case with some enclosures; and a number of other statements, including a letter from Senator McCarthy, which will be placed in the record at this point.

(The letters and statements referred to are as follows:)

WASHINGTON, D. C., *June 30, 1956.*

Mr. COTYS M. MOUSER,
Chief Clerk, Committee on Agriculture and Forestry,
United States Senate.

DEAR MR. MOUSER: There will be an abundance of testimony no doubt on S. 3503, of which I am a cosponsor. I am not only in favor of this bill but do hope

in the interest of a solution of agricultural problems that it will be favorably reported and adopted as a great step toward promoting the wider industrial use of agricultural products.

In 1933 I pioneered some tests of motor fuel consisting of gasoline with an admixture of alcohol made from corn. This matter caught on in a limited way and at one time a small distilling plant was exclusively producing moisture free alcohol for mixing with gasoline, which was distributed through 1,800 or more service stations. To be sure, there are economic factors which always intrude in a development of this kind, but it indicates that with intensive research much can be accomplished in this field.

Sincerely,

EVERETT MCKINLEY DIRKSEN,
United States Senator.

JULY 5, 1956.

HON. EARLE C. CLEMENTS,
Chairman, Subcommittee on Agricultural Research,
Senate Committee on Agriculture and Forestry,
Senate Office Building, Washington, D. C.

MY DEAR SENATOR: S. 3503, the bill to provide for a study and research program for the purpose of developing increased and additional uses of agricultural products, is in my opinion a positive approach to the solution of our farm problem.

It is essential that we create new markets instead of curtailing production and I am convinced S. 3503 would do this in addition to providing for quick disposition of our existing surpluses.

I respectfully urge your favorable consideration of this legislation.

Sincerely,

HERMAN WELKER,
United States Senator.

STATEMENT FILED BY HON. FRANCIS CASE, A UNITED STATES SENATOR FROM THE STATE OF SOUTH DAKOTA

Mr. Chairman, I appreciate the opportunity to present a statement at this hearing in favor of S. 3503, for I have long felt that research in developing industrial uses of agricultural products offers the best long-range answer to the so-called farm problem as well as opening wider the doors of the bright, new world in which we live today. We are daily reminded the benefits of research and its industrial application when we pick up and use almost any number of what you might call daily household items.

The pen I hold in my hand, the wheel of the car I drive, the clothes I wear, all reflect new methods and processes of making items cheaper easier, and better.

Each of you here is familiar with the surplus farm products that are in storage in the hands of the Government. Each bushel, each pound of those products has a potential contribution to the daily living of all Americans. All that is needed is additional study and research to show the way to putting the technicians' discovery into everyday practical use.

There is also a great opportunity to serve humanitarian needs in medicinals. Research on its present limited scale indicates that a great many drugs, many of them recognized and proved, can be obtained from farm products.

Not only personal everyday living, Mr. Chairman, but national defense can also be served. One such example that has always attracted interest is the use of alcohol made from grains and used as fuel.

At this point, Mr. Chairman, I would like to offer for the record, a list of 39 industrial products that have been developed through agricultural research, both public and private. I'm sure that while many of the uses shown are well known and recognized, others may come as a surprise to many:

Soybeans:
- Plastics
- Paints (latest development, dripless paint)
- Waterproofing materials
- Glue (especially valuable in plywood industry)
- Foam material for fire fighting
- Food shortening (especially oleomargarine)
- Coating for shotgun shells

Corn:
- Penicillin, streptomycin, and other antibiotics (corn steep liquor used)
- Testile fibers (from zein)
- Starch sponge used in surgery for hemorrhaging
- Vitamins B_2 and B_{12} for use in livestock feed
- Gluconic acid used in bottle-washing compounds
- Furfural used in making nylon (from corncobs)
- Soft grit blasting material for cleaning metal parts of machinery (from corncobs)

Animal fats:
- Livestock feeds
- Plasticizers used in making plastics
- Synthetic detergents
- Purified oleic acid, widely used in industry

Wheat:
- Alcohol for use in making synthetic rubber during World War II
- Newsprint (from wheat straw)
- Strawboard (from wheat straw)
- Monosodium glutamate (food flavor enhancer)

Cotton:
- Acetylated cotton for use in making fabrics that resist heat, mildew, and rot
- Linen-like cotton fabric (from short staple cotton)
- Gossypol-free cottonseed meal that can be fed to pigs and chickens
- Flame-resisting fabrics
- Conforming bandages (for use in bandaging elbows, knees, etc.)
- Close-woven fabrics that resist water absorption
- Tobacco shade cloths that hold up under unfavorable weather conditions
- Wrinkle-resistant fabrics

Flax:
- Cigarette paper (from domestic flax straw; new industry since World War II)
- Fiber for use in shoe thread, fish netting, sack and mattress twine
- Paints
- Linoleum
- Oilcloth

Milk:
- Penicillin (milk sugar used)
- Improved nonfat dry milk solids
- Domestic-type roquefort and swiss cheese
- Cheese from pasteurized milk

These, Mr. Chairman, are the ones that are listed as accomplished facts. These are the ones that are now being produced on a commercial scale. Thousands of bushels of grain, thousands of pounds of cotton, and millions of gallons of milk are used each year in manufacturing these products.

These are the items that have been developed. How many untold hundreds of uses are there that are but a dream in some scientist's mind? How many hundreds of ideas are filed away on a desk, notes of an unusual reaction in another experiment. A reaction, which if only time and money would allow, could be studied for perhaps a most startling use..

Mr. Chairman, I would also like to ask to have printed in the hearings a story from the June Farm Journal. The article starts, "We're on the threshold of some amazing farm discoveries * * * If we have the 'push' to engineer a bold research program."

Mr. Chairman, that is what we need to do—that is what we are trying to do—and I believe that this bill will do that.

We need to offer a bold research program. A program designed not only to help all our Nation's farmers in their problems of finding new markets for their crops, but also of finding for our people many new and better products that will contribute to national well-being.

I cannot urge too strongly that you look with favor upon this bill and do all in your power to secure prompt and favorable action.

[Reprinted from the June 1956 issue of Farm Journal]

RUBBER FROM CORN?

BACKERS OF THE NEW CRASH RESEARCH PROGRAM ALSO SEE FURNITURE FROM GRAIN, DRUGS FROM NEW CROPS—AND MORE INCOME FOR FARMERS

We're on the threshhold of some amazing farm discoveries—with dividends for farmers everywhere—if we have the push to engineer a bold research program.

That's the idea behind a $100 million crash research program now before Congress. This is 10 times more than the USDA now gets for utilization research. "But it's still less than $1 for every $100 tied up in CCC surpluses," points out Senator Capehart, Republican of Indiana, who is pushing the increase.

Here are some promising grain projects that might be speeded up:

1. Ferment grain to make a substance very similar to sap of the rubber tree. This could replace 600,000 tons of imported natural rubber which could easily be cut off from us.

Grain needed to do this job: about 50 to 100 million bushels a year.

2. Another grain-fermenting process may yield a 20-percent protein concentrate—one that is rich in amino-acid nutrients needed by livestock.

Possible use: 150 million bushels.

3. A grain-starch mixture could stretch scarce, expensive paper pulp. It makes better paper, too.

Grain outlet: possibly 40 to 100 million bushels of corn or wheat.

4. We may be able to substitute 6-cent-per-pound wheat flour for 20-cent glues used in hardboard and boxboard. Puffed wheat might make a filler in coreboard used in furniture.

Possible use: 30 million bushels.

Here are some livestock and poultry projects to be developed:

Find out how to produce choice weaning lambs in the Southeast and promote it into a "favored" regional dish. If people in these States ate as much as the national average, it would use 3½ million lambs and boost farm income by $35 million.

Develop areas free of Newcastle and other important poultry diseases. Europe and South America won't take our poultry now for fear of infecting their own flocks.

If we cleaned up some areas and maintained a quarantine, we could ship as much as 200 million pounds a year.

Finish the work on a dried whole milk—one that will keep on the shelf without refrigeration. We're close; but still have some rancidity problems. There's a $227 million-a-year pot of gold at the end of this rainbow.

Find how to really tenderize the poorer cuts of beef. The USDA says that this could add 3 cents a pound to the retail price of meat—$1.8 billion a year to the value of cattle.

Finding new crops for planting in surplus areas and on diverted acres could be an unexplored gold mine.

1. One possibility is to learn to make paper from timber bamboo, hemp, flax, and other fibrous crops. If this captured only 10 percent of the paper market, it could use as much at 3½ million acres.

2. The chances are good for developing new chemical compounds from safflower, flaxseed, and castor beans.

The USDA feels that with better harvesting machinery castor beans could replace 400,000 acres of cotton in Oklahoma, Texas, Arkansas, Missouri, New Mexico, Arizona, and California.

3. An interesting variety of medicinal crops are possible, including Tephrosia vegelii, a legume yielding a low-cost rotenone; Dioscorea, whose tubers yield a cortisone-like drug; candelilla, a wax-producing shrub; and Rauwolfia, which furnishes some of the new drugs used in treating mental diseases.

Right now there's a market that would keep 235,000 acres busy.

Dr. Byron T. Shaw, head of USDA's Agricultural Research Service, tells Farm Journal that out of every $100 that industry takes in, it sets aside $2 for research and development.

Government farm research to expand uses comes to only 4 cents out of every $100 taken in.

The surplus story (CCC inventory and loans)

[In millions]

Commodity	Investment Mar. 31, 1956		Alltime high	
	Amount	Cost	Amount	Date
Wheat (bushels)	1,096.0	$2,821	1,119.0	February 1956.
Cotton (bales)	13.1	2,275	14.3	January 1956.
Corn (bushels)	1,141.0	1,911	1,141.0	March 1956.
Tobacco (pounds)	919.0	547	1,054.0	December 1955.
Grain sorghum (hundredweight)	70.0	141	76.0	January 1956.
Cheese (pound)	295.0	115	463.0	October 1954.
Barley (bushels)	99.0	100	104.0	February 1956.
Butter (pound)	114.0	70	521.0	September 1954.
Oats (bushels)	88.0	63	92.0	November 1955.
Dried milk (pounds)	142.0	24	656.0	April 1954.

NOTE.—Money tied up in CCC inventory and loans, including these commodities above, reached a record alltime high last month of $8.9 billion.

JULY 6, 1956.

Hon. ALLEN J. ELLENDER,
Chairman, Senate Committee on Agriculture and Forestry,
United States Senate, Washington, D. C.

DEAR SENATOR ELLENDER: As the committee knows, S. 3503, of which I am a cosponsor, would establish an Industrial Agricultural Products Administration for the purpose of conducting a scientific study and research program for developing increased and additional industrial uses of agricultural products. The purpose of the bill, in other words, is to find industrial outlets for agricultural products. Some work has been done along this line in the past, but not nearly enough. I am told by people who have studied this problem that there may be a virtual gold mine at the end of the research trail if we earnestly set about looking for new industrial uses for farm products.

American agriculture is still in the throes of a grave crisis. The higher prices which the farmer must pay for the things he needs together with the lower prices he gets for his products have resulted in an ever-decreasing income to the farmer. Fundamentally, the reason for the deteriorating farm situation is that the American farmer is able to produce more than can be consumed in this country. The responsibility for overproduction cannot be laid to the farmer: he has been encouraged by the Federal Government over the past 20 years to produce more and more, only to find that there are not enough consumers in this country for what he is able to produce. This has resulted in large agricultural surpluses which have had, of course, an extremely depressive effect on farm prices.

One of the solutions to this problem is to encourage the farmer to produce less—and this is the objective of the President's soil-bank program. I believe very strongly, however, that while the soil-bank program may help the situation temporarily with respect to some farmers, it is not a satisfactory solution over the long pull. We did not become the world's mightiest economic power by encouraging Americans to produce less than they are able to produce; we will not remain the world's mightiest economic power unless we find ways to permit America to produce at full capacity. The sensible answer to the agricultural problem lies in finding new markets for our production. I am convinced that this bill is the most realistic approach yet devised for finding those new markets.

Dairy products are among those for which industrial uses may be found. Experts on this subject in the Agriculture Department are already exploring new ways of using dairy products, but they lack resources to do an adequate job. They have found already, for example, that curd milk produced by Wisconsin dairy farmers can be used in the manufacture of medicinal drugs and also for paper coatings. There are other projects for using dairy products which are under study but such propsals need additional funds if they are to be successfully explored.

Over the past 10 years the Federal Government has spent over a billion dollars in various kinds of research designed to enable the farmer to produce more. During the same period of time, the Government has spent only $90 million in research designed to discover additional uses for increased production. It seems to me that we are giving the wrong emphasis to our research program. That is

why I feel that we must allot more money for research concerning possible industrial uses of agricultural products. This bill calls for an appropriation of $100 million for this purpose. I think this is the very least that is required in order to start a realistic research program.

I feel confident that the farmers in my State will welcome this effort to fight against declining farm prices by looking for new outlets for farm production. I believe that the spending of $100 million a year to create new farm markets will be a long step forward toward taking the Government out of the costly farm price-support business, and will develop new industries and more jobs. It would thus be an extremely wise investment.

Sincerely yours,

JOE MCCARTHY,
United States Senate.

GAINESVILLE, FLA., *May 4, 1956.*

Hon. HOMER E. CAPEHART,
Senate Office Building, Washington, D. C.

DEAR SENATOR CAPEHART: Thanks very much for your letter of May 2 with enclosed Congressional Record of your presentation on the possibilities for unlimited use of agricultural products in industry through research effort. This, I have read with much interest.

I am sure you are familiar with another step now in use to follow up research developments in cotton through which one man is employed to take some of the cotton work done at the New Orleans Research Laboratory out to the cotton mills and spinning industry to get the results put into actual use. This is the same kind of thing extension people have done to carry agricultural research results to farmers and get them into general use. It is an essential step since, normally, industry, of its own volition, relies heavily on competition to force changes that involve risk money of their own. In a wartime situation the Government supplied money for changes. Your pilot-plant suggestions are very sound, then a few very highly trained men to contact industry is a step that will, I believe, speed up use of the research. I believe this approach in cotton will pay off well.

It will not be possible for me to appear as a witness at the hearing, however, I will present this matter to the president of the University of Florida for his consideration and appropriate action.

We, in Florida, generally recognize that the development of the citrus-concentrate process changed an otherwise gloomy outlook into one of brightness within a few years.

We have more people but they each eat about the same amount as a total, but have shifted greatly in the items or ingredients that make up the diet. You have hit the spot in advocating the possibility of converting some agricultural surpluses into industrial commodities and uses through research work, that will not likely be done soon by industry alone. The burdensome agricultural surpluses are comparatively recent and would not be expected to be a permanent situation. So industry tends to concentrate on natural resources that afford a long-time supply and are relatively free of wide price changes. The hazards such as one generally bad crop year could practically wipe out the present surplus situation and tend to make the overall problem better suited to Government effort. Recent cutbacks indicate how some industries handle a potential surplus. The surplus agricultural commodities now owned by the Government are not of prime concern to industry, but I feel industry would be interested in products useful in industry that were developed from such commodities.

Yours very truly,

H. G. CLAYTON,
Director, Cooperative Extension Work in Agriculture and Home Economics, State of Florida.

STATEMENT FILED BY WILLARD M. FIFIELD, PROVOST FOR AGRICULTURE, UNIVERSITY OF FLORIDA, GAINESVILLE, FLA.

I am Willard M. Fifield, provost for agriculture at the University of Florida. In this capacity my duties are to coordinate administratively the activities of the University's College of Agriculture, Agricultural Experiment Station, Agricultural Extension Service, and School of Forestry. I am also president, this year,

of the Association of Southern Agricultural Workers, and am chairman of the Commission on Graduate Education in the Agricultural Sciences of the Southern Regional Educational Board. Also, I am a member of the Governing Board and of the Committee for Encouragement of Careers in Science Relating to Agriculture of the National Agricultural Research Institute. In my present and previous activities, I feel I have gained a working knowledge of the problems confronting agricultural research workers and their administrators, and of problems incident to encouraging and training young men and women for careers in the sciences relating to agriculture.

It is on the basis of this experience that I appreciate this opportunity to submit for the record my comments concerning the proposed legislation as introduced into the United States Senate by Senator Homer E. Capehart and others, and now designated as S. 3503.

I am generally familiar with the scope and content of the statement I understand is being submitted to this committee by Dr. Louis Hawkins, chairman of the legislative subcommittee of the Experiment Station Committee on Organization and Policy, and also with the statement being submitted on behalf of the executive committee of the Association of Land-Grant Colleges and State Universities by Dr. Russell Thackrey, executive secretary. I wish to endorse these statements.

I am fully in accord with what I consider to be the basic premise of the proposed legislation. The approach to what is now the surplus production problem in agriculture, through an accelerated program of research on utilization, byproducts, and new uses is a very sound and logical one. The far-reaching results of research in many scientific areas over past years certainly have yielded sufficient examples to prove this point.

I do feel it would be unwise to create a new and separate governmental organization to administer the proposed program. It is true that the United States Department of Agriculture, and the State land-grant institutions are beset with many regulative restrictions which, to a certain extent, deprive their administrators of freedom of action in the planning and conduct of a progressive, vigorous research program. They are hampered by salary restrictions, itemized budgetary control, civil service, and other personnel regulations, and the constant frustration of attempting to implement new ideas and procedures in the face of well-meant controls imposed for safeguarding the use of public funds, but which of necessity have been adopted from experience based on the past.

In spite of these handicaps, no other nation in the world can boast such a record of solid and voluminous practical contributions from agricultural research as has been achieved by our own public agricultural research agencies. And in spite of the handicaps aforementioned, our established agencies have accumulated, through long experience, a knowledge of good research procedures which has been proven by time and results. I know a great many of the workers and the administrators in these agencies, and recognize most of them to be conscientious, able, and devoted to their task. For these reasons, and one other, I feel it would be better to channel increased funds through the established agencies. If the restrictions now placed on these agencies prohibit their most efficient operation, it would be better to modify these restrictions than to create an additional agency.

The other reason is that if a new agency, with relatively unlimited authority and less regulatory restrictions, were created as proposed in this legislation, it would not only result in a severe morale problem for existing agencies, but undoubtedly impair existing projects through loss of personnel to higher salaries in the new agency. In my honest opinion there are not enough qualified scientists now available to man adequately both the existing agencies and the new one as contemplated by this proposed bill. This would impose a competitive situation deleterious to both.

This brings me to the point that I wish to emphasize specifically, because of my responsibilities in several organizations which are working on the problem of encouraging more young men and women to enter into careers in the agricultural sciences. An excellent feature of S. 3503 is embodied in section 8, providing for grants to accredited educational institutions for fellowships and scholarships in research. Such fellowships, if they are made adequate, would accomplish much of the intended research through graduate dissertation projects, and at the same time enable many young people of high mental capacity to prepare themselves for further careers in science who otherwise are financially unable to do so. I refer not only to present undergraduate students, but to many

previous graduates already established in other pursuits, who, for one reason or other, are unable to make the large financial sacrifice involved in going back to college for advanced work. Many of them have families. Industry is recognizing this problem and in many cases is underwriting the cost of advanced study for its employees, but naturally with its own operation in view. It seems logical to encourage similar training for the public service.

There are several reasons for the dearth of trained workers in agricultural science. For many years such a career has been associated with the teaching profession and the public service. Salaries and opportunities for advancement in these have been notoriously low as compared with several other business and professional fields. The kind of young people we need for careers in science are the kind who look beyond beginning salaries and security, to opportunities of the future. A career which at best after a productive lifetime offers hardly more than twice the beginning salary, does not attract many young people who have been brought up and inculcated with principles of the American free-enterprise system. It is true that with expanding industrial research opportunities, many of our best scientists can now leave the public service for more remunerative reward in private industry. Do we want this to happen to the public service, or do we want to retain in it the best brains, for service to all the people?

It is true that S. 3503, under section 5 (c), would exempt employees from the salary limitations of civil service, and thus help accomplish this important objective, but for reasons I have already enumerated, it would be better to provide for higher salary levels in existing agencies for outstanding individuals, than under a separate agency.

The provisions of this bill, to enable increased basic and applied research, to exploit it through the pilot plant development stage, and along with these to encourage training of additional scientists for the future, are fundamental to the solution of our agricultural problem. If these fine and far-sighted principles can be retained and channeled more closely into the existing structure as developed through previous acts of Congress such as the Morrill Act, the Hatch Act, the Bankhead-Jones Act and its successor, the Research and Marketing Act, it undoubtedly will constitute an equally significant milestone in legislation for the development of American agriculture and the economic well-being of our entire Nation.

STATEMENT FILED BY CHARLES F. SIMMONS, CHAIRMAN, ORGANIZATION AND POLICY COMMITTEE, AMERICAN ASSOCIATION OF LAND-GRANT COLLEGES AND STATE UNIVERSITIES, AUBURN, ALA.

I am Charles F. Simmons, chairman of the organization and policy committee, resident instruction section, division of agriculture, American Association of Land-Grant Colleges and State Universities. The resident instruction section of the division of agriculture is composed of deans or directors of resident instruction who administer the instructional programs for agricultural students in land-grant colleges of the United States. I am also associate dean of the school of agriculture and assistant director of the agricultural experiment station of the Alabama Polytechnic Institution at Auburn, Ala. Thus, I have considerable knowledge of the problems of agricultural research and am familiar with personnel needs and the training of agricultural students in a land-grant college.

I should like to confine my remarks to section 8 of Senate bill 3503—the section proposing that grants be made to schools, colleges, and universities for fellowships and scholarships in research for the purpose of this act.

The objectives of this act may be accomplished only to the extent that qualified personnel is available to plan and prosecute the program that is proposed. And one of the limiting factors in the entire agricultural field today is the shortage of qualified personnel.

The field of agriculture includes not only that of agricultural production, or farming and ranching, but it also includes agricultural research, agricultural industry, agricultural business, agricultural education, agricultural communications, agricultural conservation, and agricultural services. These 8 fields of agriculture include more than 500 disttinct occupations and have a requirement of some 15,000 new agricultural college graduates each year. In the 1954–55 school year the land-grant colleges and universities graduated about 6,000 young men and women in the agricultural sciences—or less than half as many as were needed.

During the past 8 years there has been a sharp decline in the undergraduate enrollment of agricultural students in the land-grant colleges. In the 1948–49 school year, or during the period of peak enrollment of World War II veterans, there were approximately 44,000 students enrolled in agricultural schools of the land-grant colleges and universities. The enrollment in agriculture dropped consistently to about 30,000 in the 1953–54 school year. During the past year this enrollment was about 32,000. In the 1948–49 school year about 1 out of each 8 undergraduate students enrolled in the land-grant colleges and universities was in agriculture. Now only about 1 our of each 11 undergraduate students in these schools is in agriculture.

Two factors seem to be of greatest importance in causing this downward trend in agricultural enrollment. One of these is the generally unfavorable agricultural situation which has prevented many capable farm boys and girls from entering college at all and has discouraged others who enter from enrolling in agriculture. The second factor is the widespread publicity given to other professions and the relatively greater starting salaries paid in these fields. This is particularly critical in its influence on entering college students who might choose public agricultural service as a career. Careers in other areas usually offer so much greater opportunity for advancement because the spread between the entering salaries and top salaries in public agricultural service is so small.

The development of adequate supplies of well-trained agricultural scientists will, of course, depend on our attracting a greater number of our brighter graduates to our graduate schools. To a limited extent we have been successful in this program. During the 1954–55 school year the land-grant colleges and universities awarded approximately 100 percent more master's degrees and 25 percent more doctor's degrees in agricultural sciences than they awarded during the 1948–49 school year, which was the peak year for undergraduate enrollment in agriculture. However, the number of students earning graduate degrees is not sufficiently great to meet the needs.

If the personnel needs for college graduates in agriculture are met, a greater number of our best high-school graduates must be recruited for admission to our undergraduate agricultural curricula and subsequently to our graduate curricula. One way, and possibly the best way, of doing this is through an adequately financed program of scholarships and fellowships. Not only are scholarships and fellowships needed at the graduate level, but equally critical is the need for a program of scholarships at the undergraduate level to attract more of our outstanding high-school graduates into the agricultural curricula of our land-grant colleges and universities. These scholarships should probably be of two types: One type to recognize scholarship and financial need by providing a portion of the funds needed by the student, and a second type which would be a merit scholarship recognizing outstanding ability and providing all or most of the necessary costs of a college education.

It is gratifying that Senate bill 3503 recognizes the need for scholarships and fellowships and authorizes them. However, it would appear wise to make some provision for the administration of these scholarships and fellowships at the colleges through the authorization of funds for graduate professorships or such other teaching personnel as would be required to effectuate this program.

STATEMENT FILED BY THE AMERICAN MEAT INSTITUTE, CHICAGO, ILL.

This statement is presented in connection with S. 3503, now under study by the Senate Committee on Agriculture and Forestry, by the American Meat Institute. The American Meat Institute is a national trade, educational, and research organization of the meat-packing industry. We have as members about 500 meat packers, sausage manufacturers, and industry suppliers. This year we are celebrating our 50th anniversary.

The bill under consideration would provide for a scientific study and research program in order to develop increased and additional industrial uses of agricultural products and thereby reduce surpluses of such products. In presenting this statement, it is our purpose to suggest some of the areas with which we are familiar where, we feel, additional research is needed and could be employed to the benefit of agriculture generally.

The United States Department of Agriculture and the various State experiment stations have had continuing programs of research on agricultural problems. By

and large over a long period this research has been directed toward new strains of plants which have greater resistance to disease or insects; study of animal diseases; animal breeding; plant breeding; research on soils and the like—almost entirely directed toward the improvement of efficiency of production rather than utilization of agricultural products. In our opinion this has been a good thing. Agricultural production has increased with fewer people involved in labor on farms, and those who have moved from the farms have found profitable employment in our constantly expanding industries. It has provided a bountiful supply of food and fiber which, at the present time, is a problem, but which in the relatively near future may well become a blessing. It is our opinion that these experiment stations have been eminently successful in their objective of increasing production and increasing efficiency of production. This research, it seems to us, should be continued and augmented.

We find that in spite of the wonderful advances made by science there are great gaps in our basic understanding of the natural laws and of the biological processes. To be sure we can make more practical progress toward efficiency with the scientific facts already available—but this application of science is continually inhibited for want of knowledge.

There is room for greater emphasis on the type of applied research work going on in our State and Federal experiment stations. Appropriations for this work have increased some since 1940, but not nearly so fast as the funds for applied research in industry. (Based on the same kind of dollar in purchasing power, agriculture is spending slightly more than twice as much as it was in 1940, while industry is spending about 12 to 15 times as much. National defense, of course, is spending thousands of times more.)

The forgotten fields are in the basic sciences underlying all this applied work. Some help has been provided by grants from industry and some from the foundations. Still more help has come from our tax dollars through the National Science Foundation and through contracts between universities and the various Government departments. It is our belief, however, that agriculture has not received its share of the money being spent for this purpose. There is no way to measure this point of course because one cannot say that a fundamental study will help national defense, but not agriculture or vice versa.

There is need for a continual reappraisal of the status of our knowledge and spotlighting the many gaps. This will need to be done by the best scientists in each field.

We wish to suggest that basic research programs be augmented in universities, agricultural experiment stations, and research institutes in the following areas vital to progress in the livestock and meat industry. The following areas are necessarily broad in scope and specific approaches will suggest themselves to the scientists interested in this field. The final, practical objectives that this work might contribute to are also indicated.

1. Studies on the chemical composition and characteristics of meat and meat byproducts, which will be of great value in developing uniformity of quality and forming the basis for developing new uses for these products.

2. Studies on the carcass quality of beef and pork to include such factors as tenderness. We would like to see encouraged more studies on desirable carcass characteristics such as tenderness, size of rib eye muscle, etc., that are inheritable.

3. Meat preservation studies. This work should have the objective of getting more information to maintain quality in fresh and processed meats through freezing, new heat processing techniques, irradiation, antibiotic treatment, dehydration, etc.

4. Research on the nutritive value of animal fats. This is of great importance and much research is needed to clarify the best ways for fats to be used in the diet for man and on factors such as thermal treatment that may affect the nutritive value of fats, and to clear up many apparent misconceptions about animal fats in relation to degenerative diseases.

5. Meat flavor research. It will be of great value to know the chemical constituents that contribute to meat flavor to guide the better understanding of factors influencing meat flavor.

6. Basic research specifically directed toward securing information which would be of value in developing new commercial uses for animal byproducts such as hides, animal fats, hair, etc.

7. Physical and chemical properties of meat proteins. These studies will contribute much to understanding changes that occur in meats during thermal processing, freezing, etc.

8. Meat pigment research. The reactivity of the red pigment of muscle, myoglobin, to nitrite and other chemical needs to be known in more detail.

9. Development of better objective methods for measuring eating qualities of meats (flavor, tenderness, juiciness, etc.)

As indicated, these suggestions are in very broad outline, but perhaps they are sufficiently specific to provide an indication of the tremendous amount of work which needs to be done in our particular field. We appreciate the opportunity of presenting this statement and hope that it will be helpful to the committee.

STATEMENT FILED BY THE LEGISLATIVE COMMITTEE OF THE STATE AGRICULTURAL EXPERIMENT STATION DIRECTORS, AMERICAN ASSOCIATION OF LAND-GRANT COLLEGES AND STATE UNIVERSITIES

This is a statement by a committee of State agricultural experiment station directors composed of L. E. Hawkins, Oklahoma, chairman; L. L. Rummell, Ohio; P. F. Sharp, California; H. R. Varney, West Virginia; for and on behalf of all of the State agricultural experiment station directors in the United States Alaska, Hawaii, and Puerto Rico relative to Senate bill 3503. We represent the agricultural research segment of the American Association of Land Grant Colleges and State Universities.

This committee heartily endorses the primary objective of S. 3503, which is to stimulate and expand, through research, the industrial utilization of farm commodities. We believe farm products can and are being grown at an economical cost low enough to permit their practical use as raw materials for industry.

Somewhat at variance with the present provision of the bill, our committee believes desirable and recommends that appropriated fund support for expanded research in this field of work be made available directly to the existing research agencies of the United States Department of Agriculture and, through Federal-grants, to the State agricultural experiment stations. These agencies are now fully authorized to conduct this type of research, the proper administrative framework therefor already is established, and highly valuable work of basic importance of further progress in this field now is included in the programs of these Federal and State agencies.

This committee enthusiastically endorses the proposal of the bill to encourage young scientists through research assistantships. Application of funds in this manner long has been shown to yield large dividends in the immediate accomplishment of productive research work, and in the effective training of young men and women for key positions in programs of research.

May we thank your committee for opportunity to submit this statement for the record.

LINCOLN, NEBR., *June 18 1956.*

Hon. EARLE C. CLEMENTS,
Senate Office Building,
Washington, D. C.

DEAR SENATOR CLEMENT: Senator Capehart has recently forwarded to me a copy of a proposed bill, S. 3503, which he introduced relative to the solution of the farm problem through the use of farm products in industry. Following receipt of Senator Capehart's request I appointed a committee of our agricultural-experiment-station people to review the bill and make suggestions.

This committee wholeheartedly approves the basic principle set forth in this proposed legislation; however, they were of the opinion that there should be some changes in the administration of such a program. As the bill now stands it appears to repeat, to a great extent, the legislation that created the large regional laboratories now under the administration of the United States Department of Agriculture. The primary purpose of these laboratories was to develop industrial uses for farm residues and surplus farm commodities. These laboratories are well equipped and staffed for much of the practical application of basic information. In fact it would appear that these laboratories have exhausted the possible practical problems and have had to resort to basic and fundamental studies in order to obtain leads for investigating the areas for which they were originally created. As an example, the use of ethyl alcohol as an adjunct to motor fuels has been explored thoroughly and found to be satisfactory

except economically. The cost of production of alcohol from grains is too high to be used in motor fuels unless such a program is subsidized. It would appear that only a new basic principle of production could alter this situation since the present processing methods approach theoretical yields.

In view of these facts, we respectfully suggest that the first and major research be basic research to find entirely new procedures of production and new products stemming from agricultural materials, of which the latter will probably be most fruitful.

We should like to suggest that Congress consider the foundation of an Agricultural Research Foundation based somewhat upon the principles of the National Science Foundation or the Public Health Service. The function of this agency would be to administer appropriations for the proposed research and to see that these are closely correlated with the existing activities of the United States Department of Agriculture. We believe it is of the utmost importance that these funds be allocated primarily through research grants and contracts to existing laboratories, including the laboratories of the universities, research foundations, and industry.

In such a contract we believe that the researcher should have the greatest possible freedom in the development of his research. Where it appears feasible, we think that contracts should also be awarded for the development of new industrial processes which are based on facts uncovered by the most basic research. This would include present pilot plants available in industry and through the regional laboratories of the Department of Agriculture.

We are somewhat doubtful if a research program of this type, or any other type, could start out immediately using $100 million per year. We certainly believe that much additional money could be utilized profitably in stepping up research in the general field of industrial utilization, but we should like to suggest that the program begin with a much smaller amount, possibly $10 to $20 million for the first year, then stepping this up by equal amounts for several years. If, however, the administrative agency were to find that the program could be increased more rapidly, then we would favor stepping up more rapidly to the $100-million level.

It is our considered judgment that a program of this type has much merit and that it might do a great deal in the way of solution of the problem of surplus agricultural products which is certainly one of the most critical problems facing agriculture and perhaps the country as a whole. We hope that this program may receive favorable consideration by your committee.

Sincerely,

W. V. LAMBERT,
Dean and Director, College of Agriculture, University of Nebraska.

BROOKINGS, S. DAK., *May 14, 1956.*

Senator EARLE C. CLEMENTS,
Senate Office Building,
Washington, D. C.

DEAR SENATOR CLEMENTS: We have gone over the proposal of Senator Homer E. Capehart for a new research program and have the following comments to make:

1. The idea of encouraging new uses and markets for agricultural products is very laudable. It will not be a permanent solution and undoubtedly will not "double the farm market."

2. The value of a "crash" program may be somewhat doubtful. The feasibility of having a separate Administrator above and outside the USDA merely means a duplication of research effort. Why should not research be handled through the regular four regional research laboratories and in cooperation with the experiment stations of the land-grant colleges and universities.

3. It is relatively easy to design uses for agricultural products and to work out the conversion processes. It is more difficult to overcome such factors as (1) the need of material for soil building; (2) the costs of collecting and assembling the commodities over large areas; (3) the relatively high cost of producing raw products; (4) the relatively low cost of competitive raw materials such as air, sea water, coal and crude oil.

4. Chemurgic research has shown some promise in the past. It may result in new uses for agricultural products. However, a $100 million a year crash research program would encounter certain difficulties. These include:

(1) The program of personnel. Scientific personnel are in short supply. Increasing college enrollment will put a further strain on this supply. A crash program would encounter personnel difficulties since scientists cannot be trained on a crash basis.

(2) The problem of administration. A program of this magnitude would involve a great deal of administration. To avoid bureaucratic waste it should be planned to fit in with existing research facilities and not compete with or duplicate them.

(3) The element of chance. Any research program involves a great deal of uncertainty. A crash program of this magnitude may fail. If so, the public would probably be reluctant to support any research of this kind in the future.

5. Alfalfa and other legume forages are seldom mentioned in considering our surplus crops. Perhaps the major reason for this is that they are not generally sold as a cash crop and their production is limited by the farmer himself to what he needs for his own feeding.

From the standpoint of soil conservation, there is no doubt that legumes should play a much larger part in today's agriculture. However, there is a limit to the amount which can be planted for the purpose of soil conservation only, and to expand the use of legumes beyond what is economically sound for this purpose, for hay and pasture, for seed and oil (soybeans) and for dehydration will require new outlets for the crop—outlets which will make legume forage a better cash crop.

Legume forage does offer some promise as a crop that can be industrially processed to give us valuable products. Consider its protein, for instance. Per acre, legumes produce more protein than any other crop, and without depleting soil nitrogen. If the protein could be efficiently extracted it might find many uses, but intensive research on extraction processes as well as on methods of alteration or treatment of the protein that would yield suitable glues, sizings, plastics, etc., is necessary. Other constituents of the crop should also be considered in this research, in that they may be of value and help offset processing changes.

The approach toward solution of our problem of agricultural surplus suggested by Senator Capehart seems worthy of real consideration. However, to lose sight of our legumes in any such program would be a mistake, a step away from conservation of our soil resources.

6. Some of the statements made in defense of this program merit further study, such as:

(1) Development of powdered whole milk will result in double the consumption of milk.

(2) Hardboard, boxboard, and building board from wheat will use 20 to 40 billion bushels a year. (Production of these products involves only the straw and would not affect the consumption of grain.)

3. This plan would, within a few years, create a demand for farm products in industry at least equal in amount to that now consumed for human consumption in the United States. It would double the farm market.

4. Blending grain alcohol is feasible and would be a source for disposal of grain surpluses. However, the cost of processing would be a deterrent to wide use, unless conversion were deliberately made at a loss as a part of the surplus disposal of the farm program.

In order to prevent more serious pressures for scientific and professional personnel, a more gradual increase of amounts granted to research through USDA would be a better way to approach the problem. By increasing salaries for all personnel engaged in research, more people could be attracted into research work. When increased funds have been granted, they have gone largely into new research projects. This has forced spreading out funds to the point that it has been impossible to obtain personnel.

We consider the procurement of personnel for research as the number one problem. When obtained, they should be given freedom to approach the crucial problems in their own way at the greatest speed possible. This would require more money than is currently available for salaries and operation. We are op-

posed to creating new agencies to duplicate agencies, such as the Regional Laboratories, when existing agencies could do the job if given the money.

Sincerely yours,

JOHN W. HEADLEY,
President, South Dakota State College of Agriculture and Mechanical Arts.

Senator CLEMENTS. The first witness the committee will hear this morning is the primary sponsor of this legislation, Senator Capehart, of Indiana.

Senator Capehart.

STATEMENT OF HON. HOMER E. CAPEHART, A UNITED STATES SENATOR FROM THE STATE OF INDIANA

Senator CAPEHART. Thank you, Mr. Chairman, very much.

I first want to say how much I appreciate your holding these hearings, because I know that it is getting to be the tail end of this session, but I personally appreciate it and I know some 5 million farmers do.

I have no prepared statement, and I have spoken so much on this subject on the floor of the Senate that I would like to ask that most of what I have said previously go into the record.

Senator CLEMENTS. Let me state to the Senator that any of the statements that he has made on the floor of the Senate or elsewhere that he will clip and provide for the subcommittee will be placed in the record of the hearings on this bill following or preceding any statement that you make this morning.

Senator CAPEHART. Thank you, sir. I appreciate that.

Mr. Chairman, there is just one reason and one purpose for this legislation, and I think the best way to explain that purpose and the reasons is simply this:

That we in the United States for many, many years, in fact almost since the beginning of our country, have spent literally, I presume, one could say, billions and billions of dollars and billions and billions of man-hours teaching and showing the American farmer how to grow more and more and more, and the result is that we have a productive capacity that has given us the unique problem of superabundance.

We are at the point where the production is way up here, and our market is about here, and we have spent relatively little to find new uses for farm products and new markets.

The result an imbalance. Manufacturers and businessmen spend billions for research. They do it in order to maintain their markets.

Senator CLEMENTS. Would you permit a question or an observation at this point?

I am sure that my friend does not want to leave the impression that we have gone too far in developing techniques and know-how to increase the productivity of our land.

Senator CAPEHART. No; I want to cover that in just a moment. I have said repeatedly, and I want to say now that we have spent these billions and billions of dollars and man-hours in teaching the farmer how to produce more and more and more.

Senator CLEMENTS. I will say that there has been no money that has been spent by our Government that meant more to the liberty of this country than that money, because on that knowledge and that

know-how and that production, we remained a free people following World War I and we remained a free people following World War II.

Senator CAPEHART. Senator, let me finish. As I have said before, I am delighted and happy that we have spent all that money. I have no complaint at all. I think it was a proper thing to do and I think we ought to continue to do it.

What I am trying to say is that we have spent all of our money and all of our time in showing the farmer how to grow more and produce more, and very little on creating new uses and new markets for farm products.

Now, what I want to see us do, as a Government, I want to see us spend a commensurate amount of time finding new uses and new markets for farm products. Because we are going to do one of two things now in America as far as agriculture is concerned.

We are either going to pull down the farmer's production to the market or we are going to bring the market up to the production, and the only way in the world I know how to bring the market up is to find new uses for farm products in industry, and new markets, and then when we get production and market in balance we will continue as all other industry does, pushing both the market and the new uses and the production up together.

Now, if we do that, we will have a sound and growing economy.

Senator CLEMENTS. In order that the record not be out of balance, I think the Senator knows of my interest in the surplus situation and programs to meet it, both in research and new markets. That is well known to him and not in conflict with his views.

Senator CAPEHART. I think that the best proof of the Senator's sincerity in this matter is that he is holding hearings as chairman of this subcommittee here in July, in the middle of the summer.

As I said a moment ago, I appreciate it, and I know every farmer does, and I know every American does that understands this problem. And I know of no one that is more interested in this problem than the able Senator from Kentucky, because his State, as is my State, is made up of a lot of farmers who produce a lot of farm products.

But I first wanted to get over the purpose of this bill.

Senator CLEMENTS. The difference between you and me is that you are a big farmer and I am a small farmer.

Senator CAPEHART. I do not know about that. I know bigness or littleness is comparable to what you are comparing it to. I might be a big one in some respects.

Senator CLEMENTS. We will both admit that we are both farmers.

Senator CAPEHART. That is right.

Senator CLEMENTS. And we are both rooted to the soil and have been there all of our lives.

Senator CAPEHART. That is correct. And I am farming every day; so I do know something about farming.

But I think if we can establish the fact that we have been spending this time and this money on increasing production and have not been spending sufficient time and money on finding new uses and new markets, we will have no trouble getting this bill through this session of Congress, even though we are approaching adjournment, because I know of nothing quite as important.

Now, we just recently passed a farm bill, the main feature being a soil bank. I am not complaining about it at all. I voted for it.

At the moment, I do not know how to handle the situation of reduced production in order to raise prices other than under some kind of plan such as the soil bank. But I would like to call the chairman's attention to the fact that what we are doing in that legislation is directly opposed to that which has made the United States the greatest Nation in the world, namely, we are taking one segment of our industry in America, the farmers, and reducing their production, reducing their income.

Now, when you reduce the farmer's income, you likewise reduce the city fellow's income. You eliminate jobs. You eliminate railroad traffic in farm products that would normally be produced.

In my opinion, you create, or will eventually hurt the farmers rather than help them. But I know of no other course at the moment except for the Government to find, through research and other means, new uses for farm products in industry and new markets.

Now, let me say this. When I talk about new uses for farm products, I am talking about only those things that are practical. I am not talking about any subsidies to the farmers; I am not talking about something that is impractical. I am not talking about placing on the market that which cannot compete with something else.

I am talking about real, good, old-fashioned sound business.

So that is the purpose of this legislation.

Now, Mr. Chairman, as to the details of the bill, I have no pride of authorship, and I am certain that the others who joined with me in this legislation have not. I do not care how you handle it. I do not care how you handle it, whether you handle it all through the Department of Agriculture or whether you handle it with an administrator and the Department of Agriculture, as the bill calls for. I do not care whether the appropriation is $50 million, $75 million, $100 million, or $200 million. I do not care. I am just interested in one thing, and that is seeing that the Government, now, spends whatever time and whatever money is necessary and uses whatever organization is necessary to find new uses and new markets for farm products, because some 5 million farmers cannot do it themselves.

Now, the Government is going to have to do it. Personally, I would like to see the legislation—I would like to see the operation—patterned almost 100 percent after the way we handled the synthetic rubber situation during the war.

You will recall that we were up against a bad situation. We had to make synthetic rubber, just as today, in my opinion, we are up against a bad situation in respect to the farm economy of this Nation. And I think it requires just as much of a crash program, if I may use that expression; it requires just as much ingenuity and just as much speed and just as much money, if you please, and I think it will be the best money we could possibly spend, to get this job done as it did to produce synthetic rubber during the war.

And you will remember that we called in a man by the name of Jeffries, and we called him the czar. We made him the administrator, and we instructed him to produce synthetic rubber, and we gave him the money to do it.

Now, private industry did practically 100 percent of the job, but it was the money, it was the push from the Administrator and the mandate from the Congress and the President of the United States that got the job done.

Everybody knows what a fine job was done by that Administrator. Everybody knows today where each of those synthetic rubber plants are located, and everybody knows exactly what they are doing. They have now been resold to private industry, and private industry is operating them.

So I am not going to quarrel with the details. I do not think anybody else should. I would just like to have it done the best way, the quickest way, and the most economical, of course, but I think it must be done, because the Government has about $9 billion invested in farm products. We are spending some $365 million a year to store them. We are taxing the American people, including the farmers, to buy up huge farm surpluses and store them in Government warehouses.

We are reducing the farmer's production, which is cutting the economy of this Nation by just that much. It constitutes an emergency to me, and frankly I am amazed, very frankly, at the Department of Agriculture for not having considered this more of an emergency.

Now, I am aware of the fact that we have four Government research laboratories, and I am aware of the fact that they have done a good job. I think that they have done a good job, excepting that they have not had sufficient money; they have not had sufficient mandate from this Congress and the President of the United States, and they have not had the authority to build pilot plants. They have not had the authority to make field tests. They just have not had the push that we gave the synthetic rubber program, and they have not had the push that we normally give matters of this kind when we get into an emergency.

And to me, the farm situation is an emergency. It is better today than it was, but it is still an emergency. And I think we ought to get busy and get this job done. I do not think that we will be able on the first attempt to write perfect legislation. I do not know that we will be able on the first attempt to set up the most perfect organization, but we can at least get started.

I hear people say that you cannot spend that much money. I hear people say that we do not have the scientists and the engineers to do this job.

Let me say this to you, if they are correct, and I suspect maybe we are short on scientists, then we had better get busy on this job immediately, because the bill calls for scholarships for students to study this problem. If we are short, we had better get busy. We had better not wait until tomorrow or next week or next year. We had better get busy right now, because this farm problem is going to catch up with us.

This huge production that we have and great ability to produce is going to get worse, or get better. I like the fact that we have this great productivity. I am not quarreling with it. But it is going to get bigger and bigger instead of smaller unless the Government by regulations and laws cuts it back, and the American people do not like that sort of thing.

As a farmer, what I want is to till every acre on my farm, and I want to grow every pound I can on every acre. And then I want to have a market for it, and I want a fair price in the open market, in the free market, and I do not like the proposition of cutting back acres, although we are having to do it now, and then having the American taxpayer subsidize me.

A purpose of this bill is to get completetly away from the Government having anything to do with farming other than the research and finding of new uses for farm products. Get the Government out of production, pricing and marketing and you relieve the taxpayer of his burden; you increase the farmer's income; you increase the income of everybody that sells the farmer's production. You create more jobs. And the biggest thing that you will do, Mr. Chairman, is this: You will create in the minds of the farmers in America that it will be good, an old-fashioned American kind of political philosophy, or principle. And that is, that he is uncontrolled and he can grow as much as he wants to and he can sell it in the open market. If you continue with the kind of farm programs that we have at the moment and have had for the past 20 years, it inevitably breeds socialistic thinking.

Such thinking has a tendency to make the farmer unhappy and unsatisfied, and it makes it possible for, if you please, politicians to demagog on the matter, because in running for public office one fellow says, "Well, you elect me and I will give you a bigger subsidy," and the other fellow says, "Oh, you are a piker. Elect me and I will go it one better." And you create a very, very bad situation.

Now, I would not be advocating this——

Senator CLEMENTS. Would the Senator want a free market in agriculture and a controlled market in both labor and industry?

Senator CAPEHART. I certainly would like to have a free market in everything.

Senator CLEMENTS. All right.

Senator CAPEHART. Both labor and agriculture, and everything else, and get back, if we can, to the old principles of a representative form of government and the private enterprise system.

So the political aspects ought to be considered, because I am a little fearful of what may happen 10, 15, or 20 years from now if we do not solve this problem. And, Mr. Chairman, I know of no other way to do it.

As a businessman, I know of only two ways to increase business. One is to sell more to my existing customers and the other is to find new customers.

Now, the same thing is true in this farm business. I have gone into this very, very carefully, and I have not found anybody yet that has convinced me, and they do not try to, because they say it is a fact that our great productivity and ability to produce is so great that we are always going to have a surplus in spite of our increase in population.

That is what has been happening and that is what is going to continue to happen. For example, we have the same number of acres today in cultivation that we had 25 or 50 years ago. We had then about 350 million acres. We have about 350 million acres today. Many acres have been taken out with highways and cities, but for every acre

that has been taken out, new acres have gone in through irrigation and other means.

But 50 years ago it took 80 million acres of our production to feed the horses and mules that did the work on the farm, the power. Now, today, we do everything with tractors and we buy our power. So you have got 80 million acres there that the farmers once used to "raise" his power, about 25 percent of his acreage which he doesn't now use for power.

So you have a lot of economic problems that have entered into this matter. It can't be handled in a political way. This situation that we are in is one of economics, and it will have to be solved by economics, in my opinion. And if you try to solve it on any other basis, you are only going to half solve it or not solve it at all.

Senator CLEMENTS. Senator, would you yield——

Senator CAPEHART. Excuse me just 1 minute. I just want to call your attention to the fact that the—not the rayon, but the other indusry—is spending, I was told a couple of days ago, $60 million or $70 million to find new uses and new markets for that product to take the place of cotton.

Now, I have no objections to this at all. I am not complaining about it. But I am simply showing that here is one manufacturer spending $60 million in research to replace cotton in 1 year's time, and yet we in the United States Government here sit—at least we have—and when I say "we," I am talking about the Congress and the President and the Department of Agriculture—we sit here with a little appropriation of about $12 million or $14 million this year to find new uses and new markets for agriculture when we ought to be hitting this thing with everything at our command, because it is in our best interests.

I am sorry, Mr. Chairman.

Senator CLEMENTS. I did not want the record to remain vague on this situation. I understood the Senator to say that he would like to see the farmer in a free market. If so, being completely without protection as to price, would he not be at a great disadvantage if labor was in a protected market and if industry was in a protected market through tariffs?

Senator CAPEHART. Well, it would not necessarily follow, Mr. Chairman. It might well follow, but it would not necessarily, because if there is sufficient demand for the farmer's product, a sufficient market for it, all he could produce, then his income would be much greater than it is and his income would be satisfactory and his prices would be satisfactory.

You only get into depressed prices when you have more to sell than there are buyers for it. And that is what has happened with us today.

We are producing more farm products than we have buyers for them. Now, we have partially lost our foreign markets—not entirely. We have lost part of them because foreign nations say to themselves, "Well, we ought to grow our own foodstuffs."

One cannot quarrel with that idea, can he, because that is what we want to do, to be self-sustaining in the United States. So you cannot quarrel with that idea.

So I do not think that what the chairman suggested necessarily follows.

I will say this, that it makes it worse because the farmer is the only businessman in the world for whom the other fellow sets the price on that which he buys and then when he goes to sell, the other fellow sets the price on that which he sells.

Senator CLEMENTS. Isn't, then, the only protection that the farmer has, in a controlled market in the field of industry and a controlled market in the field of labor—is to have some stabilization if he is going to live and prosper in a corresponding manner?

Senator CAPEHART. That may well follow. I am not saying that it will not. I am saying this, that at the moment we have a huge surplus. At the moment the Congress and the President and the Department of Agriculture have decided, and almost unanimously, that the only way they could handle the situation was to reduce production under a so-called soil bank. Now, those are the facts.

Senator CLEMENTS. There is not anything new about that. That has been in the law for a good many years.

Senator CAPEHART. There is nothing particularly new about it, excepting that the purpose of this bill——

Senator CLEMENTS. It is just a new bill.

Senator CAPEHART. The purpose of this bill is to increase the demand for farm products by finding new uses and new markets, so that the farmer can grow more rather than less.

Senator CLEMENTS. The chairman of this committee, as you know, is thoroughly in accord with that, and I did not want this record to show that anybody felt, unless he wanted to say it publicly and say it openly, that the farmer sought to operate in a free market and compete with all other segments of our economy in a controlled market.

Senator CAPEHART. Let me put it this way to you——

Senator CLEMENTS. And if anybody has that view, I want him to put it in this record, but——

Senator CAPEHART. Let me say this to you, that I would like nothing better than to see the farmers operate in a free market, and I would hope that they would have sufficient markets and their prices would be sufficiently high and their income sufficiently large so that they could be very, very prosperous in that free market.

Now, if that situation does not exist—and it does not exist at the moment—then we have got to do what we are doing, and that is to protect the farmer. And I am 100 percent in favor of it. And I will continue to be in favor of it until such time as, through such a proposal as we are offering here today, there is a sufficient demand and a sufficient market for not only what the farmer grows today but more than he grows today, so that his income is big enough and he is prosperous enough without Government paternalism.

Let me say this——

Senator CLEMENTS. Pardon me just a minute.

Senator CAPEHART. I would also like to say——

Senator CLEMENTS. I want to make this statement, and I want to make it very clear, that the chairman of this committee does not want to have any mistaken idea about his position.

Senator CAPEHART. No. I do not, either.

Senator CLEMENTS. I say, "his position." And certainly, as long as I am a Member of Congress, I am never going to be willing for the farmer to go into a free market, an unprotected market for himself,

when all other segments of our economy are protected by the same protection that the farmer, in my judgment, is entitled to, as long as we do not have free markets.

Senator CAPEHART. I certainly will not quarrel with that statement.

Senator CLEMENTS. Go on. I will not interrupt you any more.

Senator CAPEHART. My philosophy is exactly the same, excepting that——

Senator CLEMENTS. I thought it was, but I wanted the record to be clear.

Senator CAPEHART. Excepting that I would be very, very happy to see the time when it was not necessary for the Federal Government in any way to interfere through subsidizing or controls or any other methods, any other way, to interfere with the farmer, because that, to me, would be the ideal situation.

Now, until we do get into that situation, then we have got to do the best we can, and I think the Congress did the best it could the other day.

The very purpose of this legislation is to create a situation where the Government can get as far out and as far away from subsidizing the farmer as it is in the best interests of the farmer and the Nation to do so.

That is the purpose of this legislation, because the farmers, Mr. Chairman, cannot do it themselves. There are about 5 million farmers or more. They cannot do it themselves, and the bill that we have before us, S. 3503, goes far beyond—I think this ought to be made clear—goes far beyond research. We have got four laboratories now that are doing, I think, a good job in research, but I think they ought to have more money, and I think we ought to have more laboratories and bigger laboratories.

But the bill goes beyond research. It goes into the building of pilot plants to prove the worth of these processes once these laboratories work them out. It goes into field tests; it goes into showing the manufacturers and processors of America how they can produce at a profit, that these things are practical, that they are competitive, because I do not want under this bill anything developed and put on the market that is not competitive with some other article. That is not the idea at all.

Let me say this, that we may well find—take your State of Kentucky and my State of Indiana—you know, it is very easy for us to grow Johnson grass in those two States. It grows wild. You may very well find if you get into this process——

Senator CLEMENTS. We have a campaign to eradicate it.

Senator CAPEHART. I know you have. And we have it in Indiana. But you may well find that if we get into this research as deep as you ought to get into it, you may find uses for Johnson grass. In other words, this might revolutionize what we grow on our farms.

In other words, who knows but what we in Indiana, instead of growing so much corn, might not grow more Johnson grass that would be used in some way, somehow, in industry, or other kinds of weeds, because the purpose of this legislation is to try to develop uses for not only that which we grow on the farm now, but the weeds and other things, or maybe weeds and other things that are grown in other parts of the United States. You might bring them over here. For example, soybeans came from China. I can remember, as old as I am, when we grew no soybeans in Indiana. I can remember that the first

soybeans I grew on my farm I grew for hay. Now I grow several hundred bushels or a thousand bushels of soybeans a year, and grow them for industry and grow them for feed and for other uses.

Now, that is what we will get into, in my opinion, once we make up our minds that we, the Congress, and the President and the Department of Agriculture want to get into this matter and get into it with both feet.

I will say to you that I think what we are talking about is going to happen, that private industry will do it in 35 or 40 or 50 years. But I think that we have an emergency here so far as the farmers are concerned, and I think we ought to do it in a much quicker time. And I am hopeful that we can pass this legislation at this session.

I understand the Agricultural Department—Mr. Peterson is going to testify—they are going to offer a substitute to my bill. They are going to ask for $50 million this year and $100 million thereafter, which is perfectly agreeable with me, because the year will be gone before we can get started. They are going to ask that they be given the entire responsibility of doing this job rather than setting up an administrator and what I call a czar.

I do not care, if they will get the job done. I do not care, if they will get the proper personnel and the proper manpower and get the proper man under the Secretary of Agriculture handling this matter. I do not care. I do not care how we do it, as long as we do this job, because I am just as confident, Mr. Chairman, as I can be that it has to be done if we are going to permanently solve this farm problem. I think it has to be done if we are going to keep the farmer out of socialism, and I think it has got to be done for the general good of the economy of the Nation.

Mr. Chairman, I have a lot of letters and telegrams and statements that I have made on this subject and I would like unanimous consent to have them placed in the record. I shall not read them. I shall not even call attention to whom they are from. Maybe I can give them to your clerk and he can place them in the record.

Senator CLEMENTS. I can assure you, Senator, it is mighty easy to get unanimous consent this morning.

Senator CAPEHART. Yes. I can well see that. And I want to be just as helpful as I can, and I want to say, "Thanks" to you, Mr. Chairman, and I am sure that the farmers of Kentucky and Indiana and every other State in the Union are grateful to you and this committee for undertaking to try to solve this problem of more production for them rather than less production. That really is what this bill does.

I do not believe I have anything further to say. I have been talking about this matter now for a long while. I just simply know that we have got to come to it, and I think the sooner we do, the better off the economy of the Nation will be.

Senator CLEMENTS. Thank you, Senator Capehart.

Senator CAPEHART. Thank you, sir.

(The letters and statements referred to are as follows:)

HASTINGS, NEBR., *June 18, 1956.*

HON. HOMER E. CAPEHART,
Senate Office Building,
Washington, D. C.

DEAR SIR: Attached is copy of letter addressed to Mr. J. LeRoy Welsh, of Omaha, in regard to surplus grains. The attached letter is long, but it is difficult to

discuss any substantial farm bill without going into considerable detail. You will note I refer to the Capehart bill in several instances. I do not know if you have introduced a bill as yet. However, I have had the opportunity to read your release of March 19, 1956, on your proposal of a $100 million research program. I believe all of us who are interested should do everything we can to assist you on this program.

For the past 20 years I have been working on a program to reduce the cost of manufacturing alcohol from farm crops, and the use of alcohol as a motor fuel. Soon after the start of World War II, I organized the Farm Crops Processing Corp. in Nebraska. Mr. Frank Robinson, of Kearney, and I began working with Government officials in Washington to secure greater use of farm crops in the war effort. We met with considerable opposition and were informed by the Director of the Rubber Reserve Board and the Alcohol Branch of the War Production Board that there was no place in the war effort for agriculture excepting to feed the people. We requested the Agriculture Committee of the United States Senate to set up a committee to investigate the situation as we had large stocks of corn and wheat piled on the ground without protection and at the same time the Government was using sugar to manufacture alcohol when sugar was rationed for civilian use.

A subcommittee was appointed with Senator Guy M. Gillette of Iowa as chairman. This committee held hearings for more than 1 year before we were able to secure approval of a program for the construction of alcohol plants to assist in the war effort. We met very strong opposition from the oil companies; also from the whisky and alcohol producers. The work of the committee is principally covered in eight volumes which are on file.

After receiving an allotment of materials and funds to construct the plant in Omaha, we were able to put the new methods we had developed into operation in the Omaha plant and produce alcohol for the Government for an average of 55 cents per gallon, where the average cost to the Government of other producers was from 90 to 95 cents per gallon.

From tests made before the war, we found the economical way to use alcohol for motor fuel was to use it with water on a 50–50 basis and blend the vapors of this mixture with the vapors from the gasoline. We found this method increased the value of all the fuel by 20 percent by increasing the power from the engine 20 percent with the same number of gallons of fuel making it economical to use alcohol manufactured from corn costing up to $2 per bushel.

I served as president and general manager of the Farm Crops Processing Corp., worked out the designs, supervised construction and operation of the plant, and directed the company affairs until October 1947 when I disposed of my interests. We placed into practical use a large number of improvements in the manufacture of alcohol. This was all done in a Government plant where no one could capitalize on patents. The processes have been given to the public.

With your program, I believe the Omaha plant should be reactivated, these processes refined and additional processes developed so that when a program is set up to use surplus crops containing starch or sugar for motor fuel, all of the design information will be available for the most economical plant that can be constructed. This is especially advisable since the program will require a large number of plants costing millions of dollars.

I will not be able to put in a great deal of time on this program. However, I will be pleased to do anything I can in an advisory capacity.

Very truly yours,

GEO. E. JOHNSON,
Chief Engineer, the Central Nebraska Public Power and Irrigation District.

JUNE 11, 1956.

Re profitable use for deteriorating Government surplus grains.

Mr. J. LEROY WELSH,
Butler-Welsh Grain,
Omaha, Nebr.

DEAR ROY: I was pleased to have the opportunity to talk to you over the telephone and receive the information you sent regarding profitable use for deteriorating Government surplus grains; also the information on Senator Capehart's bill.

In regard to the Omaha alcohol plant, in the first paragraph you state, "70,000 gallons." Our maximum daily production was between 90,000 and 95,000 gallons. However, our lowest costs were at times when our daily production was from

80,000 to 85,000 gallons. When we exceeded 85,000 gallons per day, we began to fall down on our alcohol recovery.

In paragraph 4, page 1, regarding costs of production, for the last 7 months' operation for the Government, our costs averaged between 50 and 55 cents per gallon of 190 proof alcohol. These costs included the rent we were paying the Government and all of our other costs with credit applied for the distillers dried grains sold. This credit ran from 50 cents to 55 cents per bushel of grain used. It is a safe estimate to state the distillers dried grains will return a sufficient amount to pay all the operating costs of the plant including maintenance, replacements, and retirement of investment. There will be some extra costs to start the plant after the long shutdown.

With spoiled grain, we had some periods where the larger percent of the grain used was from the bottom of outside, temporary cribs where the grain could not be used for any other purpose. This grain was hauled to the plant and as much as 75 percent was blue from mold. Our feed recovery from this grain was not so high. However, the deterioration of the proteins had reduced the weight of the grain to a point where our alcohol yield was in excess of three gallons per bushel. This was due to the fact that this spoiled grain had a much higher percentage of starch in proportion to the proteins as compared with standard No. 2 corn. At the time, we were making alcohol at a cost of 50 to 55 cents per gallon, the average price the Government was paying to all the alcohol producers was from 90 to 95 cents per gallon. This average would vary as much as 5 cents a gallon between the different months.

I believe the operation of the Omaha alcohol plant should be considered not only on the basis of using surplus grain, but also as a part of the program covered in Senator Capehart's bill because of the many improved processes we developed to cut costs in the manufacturing of alcohol.

The Omaha plant was the first alcohol plant to operate on a continuous process, automatically controlled by instruments. From the time the grain was dumped into the hopper to the weighing out of the alcohol and sacking the feed, the operation was continuous and automatic. We had only five men who had previously worked in an alcohol plant. We were able to take these 5 men, who had experience in the operation of a batch-operated plant, and in 2 weeks' time, train the personnel to operate the entire plant.

We developed 2 high-pressure steam mixing and cooking valves where in 1 minute we could do the cooking in 2 enlarged sections of the pipe as the mash moved to the coolers, doing away with about 20,000 square feet of floor space for batch cookers, which required a considerable amount of labor as these low-pressure batch cookers would have to be filled, emptied, cleaned, and refilled after each hour of use.

We developed a new method of vacuum cooling which pulled off all the odors and bad flavors of the alcohol produced from the spoiled grain, giving us a high-grade alcohol. We developed a new method of cooling the mash which increased our yields 15 percent. We developed the manufacture and use of an antibiotic which doubled the development of yeast and increased the yields 100 percent. We developed mechanical agitation and cooling in the fermenters, doubling their capacity, shortening the time of fermentation, and reducing the chance of bacteria growth which would reduce yields. We developed a new method of grinding grain, eliminating the dust-explosion hazard in plants grinding large amounts of grain.

Our allocation of equipment by the War Production Board was for a 50,000-gallons-per-day alcohol plant. With the improved methods we developed, the daily capacity was increased to 90,000 gallons.

This plant was constructed to use any agricultural product that contained starch or sugar. We used all kinds of grain and as much as 80 carloads of potatoes per day. We produced 190-proof alcohol, fusel oil, corn oil, soap stock, potato flour, and when we had the sugar shortage, we changed 1 line of production over to the manufacturing of a neutral flavor malt sirup with a daily production of 300,000 pounds. This malt sirup was used principally in the manufacture of ice cream, candy, soft drinks, and by the baking industry.

The development of these processes in a plant owned by the United States Government prevented anyone from capitalizing on these new developments. The processes are available for anyone to use without paying royalty for their use. The Government should retain the ownership of this plant, and the refinement of processes should continue at full scale production in a large plant.

I am certain we will soon be using 100-proof alcohol for motor fuel because such a program would eliminate the major portion of subsidies. Moreover, it is economical. This program will require a large number of plants costing many millions of dollars. The development work for the program could all be done at the Omaha plant, and the new plants constructed at a minimum cost.

The use of grain for rubber and the use of synthetic rubber is something that is not understood too well by the general public. About 5 weeks after the United States entered the war we requested an allocation for 5 alcohol plants. In the Congressional Library, I found Russian engineering papers which gave the complete process used in Russia for the manufacture of synthetic rubber from alcohol. These engineering papers showed they began their experiments in 1915 and by 1937 Russia was manufacturing approximately 70 percent of all the rubber they used from alcohol. At first their process was kept secret. As soon as they discovered Germany had secured their process, they began to boast about their work in their engineering publications.

The Tellay Bros., who operated a sponge rubber manufacturing company up in the New England States, translated these Russian engineering publications and we gave this information to the Gillette committee. Also, I found the men who were making synthetic rubber in Poland before that country was invaded, were in the United States. I met Dr. Rosten at an engineer's meeting. I secured his services and those of Dr. Waclau Szukieweicz, and the information covering the process developed in Poland was given to the Gillette committee by these men in person.

One of the questions regarding the cost of rubber made from alcohol which is very important is the purpose for which the rubber is to be used. It is generally stated, "1 pound of butadiene will produce 1 pound of rubber." That is true if you are going to use it for the manufacturing of innertubes. However, if the rubber is to be used for the casing of tires, more natural than synthetic rubber is required. With natural rubber, approximately 15 percent carbon black is used to give the rubber sufficient stability to carry the loads. This carbon black with natural rubber serves as a filler and does not blend chemically with the natural rubber. For that reason when the brakes of a car are applied suddenly, you see a large black mark on the pavement. With the synthetic rubber, as much as 60 percent carbon black is used because both the synthetic rubber and the carbon black are hydrocarbons; they blend chemically and become 1 element. That is the reason for the additional endurance of the synthetic rubber tires.

We developed an additional process in the pilot plant for making butadiene and filed an application with the War Production Board for an allotment of materials to construct a plant for producing butadiene by a direct-fermentation process from the grain. This process was for fermentation of butalene-glycol and processing this butalene-glycol through a catalyst which will produce 98 percent pure butadiene for rubber. Calculations showed this process would be cheaper than making rubber from alcohol. After the alcohol plants were approved, we did not request further consideration of this process.

There is another question which is not generally understood. That is, in regard to the economic use of 100-proof alcohol (50 percent water) instead of 200-proof alcohol for motor fuel.

Before World War II we had developed the use of 100-proof alcohol to be used from a separate fuel tank through a separate carburetor and the vapors blended in the manifold of the engine; 100-proof alcohol is cheaper to produce than either the 190- or 200-proof alcohol. The greater part of the advantage in the use of 100-proof alcohol is that we have been expending money from the time we have been using gasoline engines to eliminate the heat produced from the explosion in the engine. The alcohol-water mixture absorbs enough of this heat and puts it to beneficial use to increase by 20 percent the total horsepower of the engine. This also gives us a higher octane fuel. In order to make the full use of this fuel, it is necessary to have high-compression engines such as are used today. On any tests made with the use of alcohol as a motor fuel, the compression ratio of the engine should not be less than 8 to 1 and preferably 9 to 1.

We gave all the information we had developed on the use of 100-proof alcohol for motor fuel to the Gillette committee and this information was turned over to the Army. After the Army started using the 100-proof alcohol, they increased the speed of pursuit ships approximately 50 miles per hour; also this fuel was used on the B–29 bombers.

I served on an advisory committee of the Chemical Branch of the War Production Board. This committee received one report soon after the Army began using 100-proof alcohol where they stated they used 20 million gallons of alcohol reduced to 100 proof in 1 month. After that report, we could get no further information from the Army on the amount of alcohol used for motor fuel. The Army should have considerable information on the use of this fuel.

If an alcohol motor fuel is used, it should be based on the use of 100-proof alcohol because of the increased power and much greater economy. The Thompson people, who manufacture sodium-cooled valves at Cleveland, put out data sheets and curves made up from tests showing it was economical to use this motor fuel in a high-compression engine using 10 percent alcohol, 10 percent water, and 80 percent gasoline. (When the gasoline price was 21 cents per gallon, it was economical to use this fuel up to $2 corn for manufacturing alcohol because of the increase in power from all the fuel used by adding the alcohol-water mixture.)

I believe it is very important the people appointed on the Board or Commission, as called for in Senator Curtis' amendment, are persons who would do everything they can to develop the use of surplus grain for industrial purposes. I feel it is more important since there is a possibility of the passage of Senator Capehart's bill because this Board or Commission appointed under Senator Curtis' amendment may also be appointed to take over the responsibilities provided in the Capehart bill.

The experience I have had in working with the people in Washington since 1916 shows it is very difficult to get any Board or Commission set up that is not controlled in some way by people who are especially interested in the protection of their own products.

During the war the principal opposition to the construction of the alcohol plants was the oil companies. For more than a year Mr. Frank Robinson and I put in more than one-half of our time to get the allocations through. In so many places we found the oil companies had interlocking directors and financial arrangements where they were controlling the activities of a large part of the research being done by the Department of Agriculture as well as other departments.

We found Secretary Ickes had from 30 to 33 advisers, who were officers in the various oil companies and who either had indictments pending for violations of the Federal laws, or who had been found guilty of violation of the Federal laws. These were the principal men advising the Secretary on the liquid and solid fuel program during the war. Their influence extended far beyond the work they were scheduled to do.

We found one man who was secretary of the Rubber Reserve Board. He had formerly been a bank examiner in the Chicago area at a salary of $2,400 per year. He had been brought in and made secretary of the Rubber Reserve Board. He was the principal man in dealing with the oil companies on the expenditure of some $800 million of Government funds. At the end of the war, he was given a job at $36,000 per year with the oil interests. Going back over the years, remembering the trouble with Secretary Fall and others, one must realize that regardless of politics or what party is in power, it is very difficult to change policies and methods developed by our principal corporations.

One of the best things for the farmer would be if the oil companies could be induced to construct the alcohol plants to produce alcohol motor fuel and the alcohol for synthetic rubber.

I had correspondence and several conferences relative to the use of agricultural products for industrial uses with Senator Curtis before he secured the amendment. I did what I could to convince him that some group other than the Department of Agriculture should be designated in his bill to administer the program. I hope you are offered an appointment on the board and that you will take the time to serve as I am certain you could serve the best interests of the farmer. I will be pleased to give you any help I can at any time. However, I am in charge of construction of a 100,000-kilowatt electric-generating plant in addition to the operation of our project, and I cannot take much time from this work.

Something must be done to stabilize the agricultural situation. We cannot go on as we have in the past, or as contemplated under the new law. The soil-bank plan won't work on our irrigated land of which we have about 2 million acres in Nebraska.

Our district is supplying storage water to 210,000 acres of land between Ogallala and Minden, Nebr., a distance of about 170 miles. This water is appropriated for use on the land. If the landowner does not use the water for 3 years, his appropriation is subject to cancellation. When the appropriation is canceled, the landowner loses more than one-half the value of his land. Under the water contract, he must continue to pay for his water service whether he uses water or not. Also, our land values on irrigated farms have been doubled over dryland farms and the landowner will continue to pay the high taxes for several years.

There are also more than 16,000 irrigation pumps in the State of Nebraska. A very large percent of the landowners have borrowed money for constructing wells and leveling land. These landowners are not in a position to reduce their acreage. Fifty-four percent of all the corn raised in Nebraska the last 2 years was from irrigated land. In our area at least 90 percent of the people who have been in the Government agriculture program will be out by next year. I have discussed our problems with representatives of the AAA offices in our district. They don't see how any of our irrigation farmers can continue in the Government's farm program.

Our job is to work out a program where the farmer can be free of controls and not be in a position where he needs support payments. I am sure this program can be worked out. The Curtis amendment and the Capehart bill should be the foundation if the right men can be selected to administer the work required.

Very truly yours,

THE CENTRAL NEBRASKA PUBLIC POWER AND IRRIGATION DISTRICT,
GEO. E. JOHNSON, *Chief Engineer.*

STATEMENT FILED BY W. H. DAUGHTREY, ASSOCIATE DIRECTOR, AGRICULTURAL EXTENSION SERVICE, VIRGINIA POLYTECHNIC INSTITUTE, BLACKSBURG, VA.

The need for intensive and long-range research to find new and better methods of utilizing farm products is evident. Through research and education, the productivity of the agricultural plant of this country has made rapid strides. The limit of productivity has not yet been reached. Over the long pull, the best interests of the country will be served by operating our agricultural plant at full capacity. This is true not only in the best interest of the farmer and his family but also because of the large number of people dependent upon employment in the handling and processing of agricultural products. The consumer, likewise, should materially benefit when the agricultural plant can be fully utilized.

Out of my experience in working with agriculture in an educational capacity and seeing the application of research findings to agriculture, I am convinced that effective and concentrated research in utilization of farm products offers great possibilities. With the advance in technology and recent scientific discoveries, it would appear that the time is right to launch a really effective and adequate research program to find new uses for farm products as well as better methods of processing and merchandising these products to the end that both the consumer and the farmer will benefit.

Therefore, it is my considered opinion that careful consideration should be given to and positive action taken on farm research bill S. 3503.

STATEMENT FILED BY J. R. BECKENBACH, DIRECTOR, AGRICULTURAL EXPERIMENT STATIONS, UNIVERSITY OF FLORIDA, GAINESVILLE, FLA.

The proposal that additional funds be appropriated by the Congress for research on new industrial uses for agricultural commodities would certainly result in an increased demand for such commodities. It therefore seems to be a sound approach to the current problems of surpluses and low prices.

I will confine my remarks to the matter of the most effective means of making research funds for the purpose available to the States in the agricultural experiment stations of the land-grant colleges.

It is proposed in the bill that such funds be made available through contracts covering specific research projects. In my opinion, this would be much less effective than would be the method already followed under the Hatch Act, which, in effect, appropriates funds directly to the States in continuing annual amounts.

The difficulties of contract research in agriculture at State experiment stations are twofold. First, the personnel problem is difficult. The securing of trained research personnel under a contract is difficult because of the lack of permanence of the positions. Whereas this may be compensated for partially by increasing salaries, if this is done, another problem is developed with other personnel at the college who have permanence during good behavior, but who are on academic salaries at prevailing scales.

Second, continuing and dependable appropriations permit more careful planning, especially in a research area requiring the kind of facilities and equipment needed in the type of research proposed. Most State stations are already doing research on agricultural byproducts and/or processes. Continuing funds specifically appropriated for industrial-use research would greatly stimulate such programs. Contract research could not be expected to do this to anything like the same extent.

The Florida station has been increasingly getting into the industrial use research field, and long-range plans are already underway to gradually increase research in this area. Federal assistance in the form of continuing grants would greatly step up the pace of such work, and since the work would be done at the land-grant college, a correlative byproduct would be the training of additional personnel, since graduate students could work directly in the program. This would tend to minimize the personnel training problem, which will be an important factor in any sharp increase in this research effort.

STATEMENT FILED BY J. CARROLL BOTTUM, PROFESSOR OF AGRICULTURAL ECONOMICS, PURDUE UNIVERSITY, LAFAYETTE, IND.

The basic current problem of agriculture is that the United States agricultural plant is geared to produce 5 to 6 percent more total agricultural products than the present market will take at generally acceptable prices. Any program which will aid in bringing the supply and demand of farm products into a more acceptable balance is worthy of serious consideration. This better balance may be brought about by expanding the market or shrinking the supply or both.

Expanding the market as a solution to the farm problem is obviously a much more satisfying approach to farmers and to society than shrinking the supply. Therefore, a research program designed to expand the use of agricultural products by industry is worthy of serious consideration.

Outside of cotton and wool, industry now uses between 3 and 5 percent of the total annual agricultural production. If this could be doubled or tripled in the near future it would do much to aid in the solution of the farm problem.

This increased use of agricultural products by industry would also make the Nation more flexible in times of national emergency. It is difficult to increase or decrease agricultural output quickly as compared to most industrial production. If a higher percentage of agricultural products were used by industry in normal times it would make it possible to shift to the nonagricultural sources of supply in times of national emergency. This would release food products if they were needed more than industrial products.

As we look at the long-run sources of supplies of basic organic materials it appears that we may need to draw more heavily upon those produced in agriculture in the future. This becomes particularly pertinent when we look at the prospective supplies of petroleum and wood products in terms of the projected demands. These represent two of our main sources of supply of organic materials. For this reason it appears that we should now be giving more attention to the possibilities of supplying more organic raw materials from agriculture by developing new plant varieties and new processes for converting these agricultural plants into industrial products.

From such a research program as proposed in Senate bill 3503 is the possibility of developing new products which benefit all of mankind. These products may be developed even though they may not add in any material way to the quantity of agricultural products used by industry.

However, in appraising this proposal as a solution to the agricultural problem we must look at the obstacles which must be overcome. One of these is finding

uses for agricultural products in industry which can carry the relatively higher costs involved when agricultural products are used as a source of supply. Agricultural products and byproducts must be assembled from many individual farm units. This is now expensive compared to taking the organic materials from centrally located supplies like from a well, a mine, or a forest. Either we must discover new industrial products which can best be produced from agricultural products and which are of sufficiently high value to absorb the higher costs involved when agricultural products are used as sources of supply or we must discover new lower cost processes for transforming agricultural products to industrial uses relative to the cost of transforming materials from other competitive sources into the same quality industrial product.

A second hurdle to overcome if such a program is to assist in the solution of the present farm problem is that of getting it in gear rapidly enough to bring results in the immediate future. Most programs for expanding the outlets for farm products require considerable time. This is true in this case unless the program can be materially speeded up. It offers a greater opportunity as a longer-run solution rather than for the immediate. Throwing more resources quickly into the activity may make it possible to speed up the program, but too much should not be expected of it too quickly. It takes time to make new discoveries and to incorporate these new processes into the industrial and agricultural production framework.

This matter of timing raises the question of how rapidly such a program can be expanded and how much trained personnel can be assembled quickly without seriously damaging other important research activities. This needs careful consideration by those in a position to appraise this phase of the problem.

It does appear from past experience and from present expenditures for research in this area that such a program should be closely coordinated with the work of the Department of Agriculture and the work of the land-grant colleges. Many competent scientists feel that this type of research should be closely coordinated and closely associated with work in the other types of agricultural research because it not only involves chemical processes but it also involves plant breeding and many other lines of basic research being carried on by the Department and the experiment stations of the land-grant colleges.

Recognizing these problems, it still would appear that the longer-time gains from such a program to agriculture and to society justifies increased expenditures for research in this area. Therefore, I should like to endorse the basic concept of more publicly supported research for finding more uses for agricultural products in industry. The speed with which the program is carried out and the magnitude of the research program must be equated with the number of technically trained people available on the one hand and the urgency of the problem on the other.

REMARKS OF WHEELER MCMILLEN, VICE PRESIDENT, FARM JOURNAL, INC., PHILADELPHIA, PA., BEFORE A LUNCHEON GIVEN BY SENATOR CAPEHART, APRIL 30, 1956

Prosperous America provides the perfect proof that scientific research pays off.

On every hand we see and enjoy the products of research. Making and selling those products creates the incomes to buy them.

In daily use we command scores of new conveniences. We have seen huge new industries grow up out of research discoveries.

We hear the leaders of very old companies report that most of their sales income derives from products not in existence a decade or so ago.

Characteristic of every growth industry is a relentless search for new uses for its products, for new products to make, and new markets.

Suppose that the petroleum industry had never sought to make and sell anything except kerosene, gasoline, and lubricants. Suppose the electrical equipment makers had been satisfied to sell motors and light bulbs. Suppose the chemical companies had been content with a few acids and salts.

I mention these things in order to emphasize a comparison between modern industry and modern agriculture.

Agriculture has, indeed, benefited tremendously from research. Tractors, power equipment, rubber-tired machines, electrification, hybrid seed corn, anti-

biotics, new weed and bug killers, new livestock medicines—all these are products of research which farmers have eagerly accepted.

Every one of these research products helps to increase the total farm output, usually at less cost per unit.

Like an army in action, progress advances in salients. Agriculture has made astonishing gains on the production salient. That is where most research has been directed. It has paid well.

Now the pressing need is to find more ways to consume the output. It is on this utilization salient that equal and in fact greater research effort has become urgent.

That industry itself depends vitally upon research for its own profits and expansion, is well known. Industry researches for new products and new uses—researches to sell as well as to produce.

The electrical-equipment industries, investing nearly $800 millions yearly in research, do not appear to be troubled by surpluses.

The aircraft industries, spending more than $750 millions a year for research, do not worry about surpluses.

The chemical industries, investing more than $310 millions in research annually, appear to be selling all the products they make.

The petroleum industries spend for research about $150 millions a year; the primary metal industries about $60 millions; rubber industries about $54 millions; stone, clay, and glass products, about $40 millions. They are all prosperous.

In comparison, the most liberal estimates indicate that the huge agricultural industry has for all its research purposes not more than $300 millions, originating about equally from public funds and from private expenditures.

A substantial fraction of this goes for routine inspection and similar activities which are not really research.

By far the largest amounts go for purposes which result in increasing the total output without consideration of how the output can profitably be sold.

The privately financed research in agricultural fields, has quite naturally, been directed toward finding products which can be sold to farmers. A very small proportion has been devoted to enlarging the markets for farm output or to finding new uses for crops.

Farmers themselves believe strongly in research. This has been demonstrated by the avidity with which they seize upon new methods and incorporate them into farm practice.

Through cooperatives and by other means farmers themselves finance research out of their own pockets to the extent of 3 or 4 millions annually.

A survey of several thousand Ohio farmers listed 11 different approaches to the surplus problem, and asked that those considered most promising be indicated. Research for new uses and new markets, topped the list with approval by more than 70 percent of those who responded.

The American economy has an insatiable appetitie for products other than food.

To whatever extent this appetite can be satisfied by organic materials, originating from the annual growth of crops, agriculture has field for expansion. Research can explore these fields in three directions.

It can seek new industrial, nonfood uses for the crops now grown.

It can hunt out new crops to supply materials needed in industry.

It can undertake to find profitable markets for the agricultural wastes and residues which now cannot be sold.

These have been the three basic areas of farm chemurgy.

Without attempting to chart particular studies, it may be noted that the Nation's building industries consume enormous quantities of materials from cellar to roof paint. There may be new markets here for farm products. Demand presently exceeds supply in the paper industries. May not more abundant and perhaps cheaper sources of cellulose be developed in agriculture, whether by way of more efficient trees, by bamboo or by annual cellulose crops? The fast-growing plastic industries demand a tremendous variety of materials; lately, thanks to utilization research by USDA laboratories, they have started to use substantial quantities of our inedible fats and oils. Nearly every industry offers some potential market for farm products—the problem of research is to fit the product to the potential.

Nature creates in plants an infinite variety of chemical compounds. A few of these, or substitutes for them, can be synthesized cheaply. Agriculture has lost some markets because its own research failed to best the synthetics. But the

natural compounds—agriculture's starches, sugars, proteins, fats, celluloses and others—do afford limitless industrial possibilitie.

The four utilization laboratories now operated by the Department of Agriculture have produced commercial results justifying their costs many times over. They have been able to scratch the surface. Their studies have developed innumerable new questions which call for exploration. The need now is to do on an adequately large scale what has proven profitable on a small scale. All sorts of fertile scientific minds need to be engaged, whether they work in Government, in universities, in independent institutions, or private agencies. Such minds will bring to bear fresh approaches, and broad experiences.

Industry has proven its readiness to work hand in hand, and to adopt every advance it can put to economic use.

If you ask me what industrial uses may emerge from greatly multiplied research efforts, I must answer that I don't know.

When Du Pont authorized a major research outlay to investigate the behavior of something called long polymers, no one there knew that the end product was to be nylon—and still less did anyone expect that in time a lot of nylon would be made out of corncobs.

The priest, who 30 years ago, amused himself by investigating the properties of acetylene gas, was amazed to be told that his discoveries had made possible the first synthetic rubber.

The wartime effort to put oranges into powdered form for the Armed Forces did not anticipate its eventual result—the frozen citrus concentrates that have vastly extended the market for the whole citrus industry.

We do know that science has accumulated an enormous arsenal of facts. We do know that an ever-increasing variety of techniques constantly expand their sales because they invest liberally in research.

What Golcondas and Spindletops the vegetable kingdom still conceals from man no one can guess.

A dozen plant species yield four-fifths of the food the human race consumes. About 200 species engage all commercial agriculture. Only about 1,500 species are known to have any human use. This leaves about 300,000 species whose potentials are relatively unknown.

Only one important species has been added to agriculture since man began to record his history. That is rubber. Stone Age man, who had few tools and no laboratories, selected all the others.

Except for rubber and soybeans, possibly for cotton and oranges, the full resources of modern science have been brought to bear on very few plant species.

Among the neglected wild plants of the world new riches undoubtedly await discoverey—new medicines, new flavors, new aromas, new oilseeds, better livestock feeds, new industrial materials—perhaps a new product as useful and important as rubber.

New crops, sufficiently attractive and profitable to take over a few thousand of our present acres, could prevent surpluses from being grown.

As evidence, look at the soybean, ancient in Asia but new in America—and imagine the surpluses of corn and oats we would certainly have now had not that new crop been established.

The oil industry goes wildcatting for new sources. Other industries seek new markets to supply. Should not agriculture follow such profitable examples?

It is almost redundant for me now to add that I most heartily favor S. 3503, the bill which Senator Capehart and 33 other Senators have sponsored. Every prospering, expanding industry in America testifies that the principles which S. 3503 proposes to apply to agriculture are effective principles. I can assure you that every thoughtful farmer will favor its support.

There is, I believe, no serious criticism of the principle that research for agriculture must be mainly a public responsibility, and that it is in the interest of all the people.

The surplus problem will not disappear quickly. Currently agriculture produces around 5 percent above effective demand. Because the techniques of production are improving so rapidly, despite the steady population increase, indications are that 10 years hence production can outrun demand by 10 percent, and that it may take 30 years for population's requirements to overtake agriculture's output.

Even though research results may come slowly, they will be needed.

If the Congress will adopt the principles of this bill and will provide adequate funds through the years, it will have taken the longest and soundest possible

step toward making agriculture a permanently prosperous, expanding industry.

It will add new products for the American standard of living. It will build new factories and create new jobs for the years ahead.

It will provide for American industry unfailing sources of raw materials—materials which will be ever-renewable, annually reproducible, as long as soil and water are conserved.

It can in time remove, probably forever, the urgency for agricultural subsidies.

It will work toward making American agriculture the growth industry that farmers want it to be. It will provide expanding opportunity for the family farm. It will make it possible for more of our fine farm boys and girls to live and prosper on the land they love.

This proposal offers, in short, an infallible plan toward a richer civilization and therefore toward a better America.

KNOXVILLE, TENN., *June 19, 1956.*

Hon. HOMER E. CAPEHART,
United States Senate,
Washington, D. C.

DEAR SENATOR CAPEHART: It was kind of you to write me as you did in your letter of May 2 and attach to your letter a reprint from the Congressional Record of the text of a bill which proposes a $100 million research program, to find new industrial uses and utilization of farm products.

It has been my feeling for quite some time that the major solution of farm problems is to find new uses for many of our agricultural products and a wider variety of use of many of these products.

It has not been so many years ago that the average grocery store carried about 1,000 items or less, and now the supermarket carries 5,000 to 6,000 items. These food products basically are the same but they appear on the shelves of the supermarkets in many different ways—thus increasing the consumption of them.

It has been my opinion, also, that we should endeavor to process and put up for consumption many of our basic farm products in many different ways, which would multiply the demand for them manyfold by the consumer.

Much of the research emphasis in agricultural products has been put on production and there has not been the emphasis put on marketing and utilization to the degree that the increased product warrants. It has seemed to me sometimes that on the utilization is where we need to put the research emphasis.

I appreciate your writing me and sending me a copy of your remarks. They are very good.

Yours very truly,

C. E. BREHM, *President, University of Tennessee.*

INDIANAPOLIS, IND., *June 29, 1956.*

Hon. HOMER E. CAPEHART,
United States Senate Building,
Washington, D. C.

DEAR SENATOR CAPEHART: It is unfortunate that the newspapers have given S. 3503 so little space. I had read only vague references to the fact that you "had in mind" a substitute proposal to offer for the controversial farm bill, but knew very little about it until I received a copy of the April 30 address by Wheeler McMillen.

"Thank God," I said to myself, "at last we have a proposal to really get at the root of the farm problem instead of putting farmers on a dole, encouraging them to continue to overproduce the products which are already stockpiled for years ahead, or similar self-defeating palliatives. Of course research is the answer. Look what Carver did for the peanut farmers with the limited funds and facilities he had to work with. I feel sure that if the Government had spent half as much on research to increase the farmers' markets as it has on restricting production, buying up surpluses, and otherwise artificially manipulating prices during the past 20 years, the farmers would be as prosperous as any segment of our economy today.

More power to you and S. 3503.

READ & RICHTER,
HORACE M. REED.

RENNER, TEX., *July 3, 1956.*

Senator HOMER E. CAPEHART,
United States Senate,
Washington, D. C.

DEAR SENATOR: I regret that I will be unable to testify before the Senate Agriculture Committee on Friday morning, July 6. Your kind invitation to do so is very much appreciated.

I am heartily in accord with the objectives of your farm research bill, for our greatest need is to develop new industrial outlets for agricultural raw materials. I trust that you will be able to make some provision in the bill so that independent nonprofit research organizations such as Texas Research Foundation will be eligible to participate in this research program you are fostering.

I am enclosing two brief releases on our organization which will give you some indication of the type of work which independent non-tax-supported foundations and laboratories are carrying on in the United States at present. These institutions could contribute greatly to the solution of the problem which your farm research bill covers.

My heartiest best wishes to you for the success of your effort to put this bill through the present session of Congress.

Sincerely yours,

C. L. LUNDELL,
Director, Texas Research Foundation.

(NOTE.—The releases referred to above are on file with the committee.)

Senator CLEMENTS. The next witness we have is the Assistant Secretary of Agriculture, Mr. E. L. Peterson.

Senator Capehart, would you like to stay here?

Senator CAPEHART. Yes. I would like to remain a few minutes, and maybe longer.

Senator CLEMENTS. I am sure the committee will be glad for you to stay and participate in the hearings.

Senator CAPEHART. Thank you, sir.

Senator CLEMENTS. Mr. Peterson.

STATEMENT OF HON. E. L. PETERSON, ASSISTANT SECRETARY OF AGRICULTURE

Mr. PETERSON. Thank you, Mr. Chairman.

I appreciate the opportunity of appearing before you today to discuss Senate bill No. 3503. This bill provides for a scientific study and research program to develop increased and additional uses of agricultural products that will reduce surpluses and raise the income of farmers.

The idea of developing, through research, up-to-date utilization of farm commodities is not new, of course, but never before has an attack on farm surpluses through research, as proposed in this bill, been tried on so large a scale. We won't pretend that research will solve the present surplus problems all by itself. We shall certainly need all other programs and tools that may be found useful for handling surpluses. But there's no doubt that large-scale research is one of the most important tools at our command.

It is unrealistic to assume the future of agriculture must be one of chronic surpluses. As members of this committee are well aware, favorable markets always have been a master key in opening up periods of farm prosperity.

With your permission, I would like to trace the historical relationships of favorable markets and full utilization to farm prosperity.

It will illustrate, I believe, the importance of the bill under consideration, which could be a vital link in the development of more favorable markets today.

In earlier times this form of research would not have been so important. The colonial farmer's market was his own family. Nine out of ten people lived on farms. For many years after adoption of the Constitution, the principal agricultural emphasis was on rapid settlement of the land—opening of new farming opportunities to the fast increasing population.

In the midcentury decades of 1830 to 1860, however, a distinct change became apparent. Farm output, already growing by virtue of millions of new acres in cultivation, took a spurt forward as American inventiveness put an increasing variety of machines on farms. Production costs in some cases were cut in half. Man-hours of labor required to produce an acre of wheat dropped from about 60 to 35. An acre of corn could be produced with approximately 70 hours of man labor. The first big step in the technological revolution on American farms was being taken.

By the 1850's the average farmworker could produce enough for himself and three others. Agriculture was becoming less a dominant user of manpower, and more a supplier of labor for urban industries.

Production for markets was becoming more prevalent. This shift was encouraged strongly by the building of railroads, which for the first time put millions of farms in touch with expanding markets, both domestic and foreign.

Then came the war between the States—bringing with it a letup in the westward expansion of agriculture and an urgent need for more foodstuffs. At the same time, there was a growing demand from Europe for our farm products.

After the war, thousands of young men took advantage of the homestead laws and converted millions of acres of fertile, easily broken prairie land into farms. Between 1870 and 1900, the number of farms and farm acreage doubled. So did the production of major crops such as corn, wheat, and cotton.

This abundance could have had disastrous effect on farm prices if there had not been a huge and growing market, both here and abroad. Even so, prices drifted downward.

When the 20th century opened, our country was on its way to becoming a strong industrial nation. Commercialization of farm production for markets was firmly established. More efficient farming helped make this possible. The farmworker could now provide enough for himself and six others, who were thus freed for work in towns and cities.

During the early years of this century, agriculture, therefore, entered a more industrialized economy. The increase in population, stimulated in cities by heavy immigration, absorbed most of the increase in farm production. Farmers thus depended less on foreign markets, even though farm products still constituted the bulk of our exports.

By 1914 United States agriculture was in a golden period. Farm prices were relatively high and comparatively stable. Cotton, wheat, and pork were finding a market in Europe.

Outbreak of World War I in Europe did not at first greatly affect farm markets. By 1917, however, conditions began to change. Our

concentration on providing the Allies with munitions, loans, and food enormously increased demands on farmers. Poor crop years, however, prevented substantial increase in production. Food conservation drives were resorted to. Most of us remember, I'm sure, the wheatless and meatless days; and the struggle to get enough sugar at any price.

Farm prices rose rapidly and continuously, buoyed by high employment and high wage rates.

Even after the armistice, demand continued to rise, because European nations were permitted to use unexpended credits to buy supplies. Then, too, domestic buying power was still high. Thus, wartime farm prosperity continued for a time.

When wartime credits were ended in June 1919, however, exports declined. By 1921, wheat and hog prices had dropped to less than half. Corn dropped to a third. Wool was almost unsalable.

Caught with debts for land and equipment purchased at high wartime prices, and faced with continuing high prices for operating supplies, farmers quickly found themselves in a sharp, painful cost-price squeeze.

Many farmers were in distress for most of the next decade, but the rest of the Nation was comparatively prosperous. Agricultural production remained high, while foreign markets remained depressed and uncertain.

Senator CLEMENTS. Right at that point, Mr. Secretary, there was protection for industry at that time through tariffs.

Mr. PETERSON. There was a degree of protection, Senator.

Senator CLEMENTS. There was no protection of agriculture in any shape, form or fashion; is that correct?

Mr. PETERSON. I think on that issue or that point, the question is one of comparative bargaining power.

Senator CLEMENTS. It is not a question of an issue. It is just a question of what is the fact.

Was there any support price for farm products at that time?

Mr. PETERSON. Not at that time, sir.

Senator CLEMENTS. All right.

Mr. PETERSEN. Most assuredly, the comparative bargaining power between agriculture and other segments of the economy was most disproportionate, then as it is now.

Senator CLEMENTS. Except that one of them was in a field of protection and the other one was completely without any governmental protection of any kind.

Mr. PETERSON. One was without and the other was protected at least wholly or in part, depending upon the activity engaged in.

A new approach to the farm problem, widely known as "equality for agriculture" was sponsored in several proposals in Congress during the twenties. Most of these failed to become law.

In 1929 the Agricultural Marketing Act was passed. Its aim was to provide a mechanism for the orderly production and marketing mechanisms of other industries. A revolving fund of $500 million was put in the hands of a Federal Farm Board, which attempted to stabilize declining farm prices by buying and storing millions of dollars worth of wheat and cotton.

The Farm Board has no way of limiting production, and most of its funds were quickly committed, despite the drought of 1930. It

went out of existence in 1933, its legislative authorization and remaining assets being used to create the Farm Credit Administration.

With mounting surpluses and stagnant markets staring farmers in the face, the argument for production control came forward. The Agricultural Adjustment Act of 1933 provided for crop control for the first time by offering benefit payments for acreage reductions.

After this act was invalidated by the Supreme Court in 1936, it was quickly followed by the Soil Conservation and Domestic Allotment Act of 1936.

In 1938, a new Agricultural Adjustment Act attacked surpluses through a plan of marketing quotas which farmers could vote on themselves, by commodity groups. It also provided for diversion of surpluses and for development of new uses for agricultural products.

These measures of the thirties, which were strongly influenced by earlier plans, have left their mark on succeeding farm programs.

During this time, the farmers' plight began to stir interest in finding new industrial markets for farm products.

Authorization by the Congress in 1938 of four regional utilization research laboratories to greatly expand the search for new uses for farm products was evidence of the widening realization that farm markets could be expanded by aggressive use of science and technology—a fact that was being demonstrated profitably by many industries.

Dr. Hilbert, Director of Utilization Research, and his associates, are prepared to discuss the work of these laboratories in more detail, so I will not take the committee's time, except to point out that World War II intervened just as the laboratories were getting underway. The direction of their work was soon changed and heavy emphasis was given to finding ways of stretching our domestic supplies to cover defense requirements.

The war placed heavy, all-out production demands on agriculture. Farmers were able to meet these demands because improved practices resulting from research made it possible for them to increased output to the highest level in our history. One farmworker could produce enough for 14 persons (today the figure is 18 persons).

Agricultural prosperity lasted longer than it did after World War I, because of the vast need for agricultural products in Europe after fighting ceased.

When this impetus subsided, farmers were again troubled by shrinking markets until the Korean conflict broke out, and they once more were able to get a reasonably satisfactory share of the Nation's prosperity. Demand slackened at the end of hostilities, and surpluses began to pile up.

Farmers today are troubled. Farm prices have declined and farm costs have increased. Supplies of important farm commodities are in excess of available markets. Surpluses have accumulated.

I believe there's a lesson for us in the striking similarities in the farm problems of the 1860's, the 1920's, and now. Events of the 1860's demonstrated how expanding markets can balance expanding production. Those of the 1920's showed that the prosperity of agriculture is dependent on the size of the market. Events of the 1950's are proving that we cannot solve farm problems solely by limiting production or buying up surpluses.

We must conclude, then, that to solve the surplus problem we must expand markets. We have three possibilities for doing this: (1) Stretch the export market as far as we can, (2) increase per capita consumption of higher quality foods, and (3) devise new uses for established crops and develop new crops with good market potentials as alternatives to those in surplus.

We must use all three.

With respect to the first possibility, the Department is engaged in a full-fledged drive to open up new markets abroad, and considerable success has been attained.

In 1955, exports of agricultural products increased 5 percent in value and 11 percent in quantity over 1954. Government programs include the stimulation of commercial sales for dollars; sale of surpluses for foreign currency; food and fiber donations; loans of the Export-Import Bank; and barter of farm products for strategic materials. These programs accounted for about a third of the export volume.

Despite these successes, we cannot depend on a repetition of the circumstances that 50 and 75 years ago made exports a major outlet for our marketable farm goods. While export markets are and will always be important, new and expanded markets will most likely come largely from our own economy. And this brings us to the other two possibilities.

Let's consider briefly the possibility of increasing per capita consumption of higher quality foods. As you know, nutritionists consider high-quality diets as those containing adequate amounts of meat, eggs, milk and other livestock products, and fruits and vegetables.

There's been a strong trend toward more minerals and vitamins, as well as proteins, in our diet the past dozen or 15 years, and this trend is becoming stronger. This means the demand for livestock products is likewise gradually increasing.

There's much to be said for attacking surpluses of cash crops by research to improve efficiency of livestock and feed production so that farmers can profitably supply this expanding market. The Department recognizes this opportunity and sizable increases for livestock and forage work have been provided in the Department of Agriculture Appropriation Act for 1957.

Senate bill No. 3503 deals directly with the third research possibility for attacking surpluses—and creating markets—that of creating new uses for established crops and developing new crops with good market potentials as alternatives.

With this objective the Department is in full accord. A statement has been filed with this committee giving the views of the Department, and offering several suggested revisions of the bill. We believe these revisions would make the purposes of the bill more readily achieved and are necessary to its effective implementation.

With the committee's permission, I will briefly restate the points.

We believe better coordination can be realized and duplication of organization and functions avoided if, instead of the organizational arrangements proposed in the bill, all responsibilities imposed by the act are placed with the Secretary of Agriculture.

Much of the work contemplated is closely related to or complementary of work already underway pursuant to regular programs.

The bill calls for an immediate, large-scale program. Rapid expansion of work such as the bill authorizes would require many contracts with private industrial laboratories, universities, and other institutions capable of undertaking various phases of the work.

In fact, almost all of the work the first year would be done under contract. We have recommended, therefore, that appropriations, authorized at $100 million in the bill, should be scaled to $50 million the first year of operation.

This would lay the groundwork adequately for a full-scale, fully rounded program as more personnel and facilities become available.

This bill also contains several provisions we firmly believe must be included if this activity is to produce the expected results. Among these are:

(1) Exemption from provisions of the Classification Act of 1949, as amended, of such technical and professional positions as the Secretary may certify as necessary to the effective operation of the program for which the bill provides; and

(2) Authority to make grants to facilitate some types of fundamental research which cannot adequately be obtained by contract.

These provisions are beyond authority now vested in the Secretary of Agriculture.

Request for authority to exempt certain certified technical and professional positions from the provisions of the Classification Act is made without intent to in any manner impair the Classification Act or to create problems for fair, equitable, and uniform personnel administration policies or programs.

I wish to emphatically state that the Department of Agriculture is in full accord with the purposes of that act. In the present matter, however, an aggressive and large program of research to attack the problem of providing satisfactory markets for substantially larger volumes of our agricultural commodities is clearly intended.

We believe the successful implementation of the proposed program would be seriously impaired if such authority is not provided. The authority requested would, of course, be subject to administrative control within the Secretary's Office. It is our intention, should this authority be provided, to exercise it in accordance with government-wide policy and not unilaterally.

Agriculture has been subjected to rapid change during the past quarter century. Changes have come with increasing acceleration since the conclusion of World War II—production techniques, marketing methods, consumer preferences.

Many new products and old products in new form, as well as new uses for farm products, have been found—all as a result of the findings of research and experimentation.

While it is quite obvious all solutions do not reside in this area of effort, we are firmly of the view that the proposal before this committe would afford a workable and powerful tool to help resolve some of the most pressing current problems of agriculture, to the benefit of the farm people of our country and of all of us.

Senator CLEMENTS. At this point in the record, I would like to place the letter from the Under Secretary of Agriculture, Mr. Morse, ad-

dressed to Senator Ellender, the chairman of the committee, under date of July 6, with the proposed bill that is offered by the Department of Agriculture.

(The letter and bill referred to are as follows:)

DEPARTMENT OF AGRICULTURE,
Washington, D. C., July 6, 1956.

Hon. ALLEN J. ELLENDER,
Chairman, Committee on Agriculture and Forestry,
United States Senate.

DEAR SENATOR ELLENDER: This is in reply to your request of March 22, 1956, for a report on S. 3503, a bill to provide for a scientific study and research program for the purpose of developing increased and additional industrial uses of agricultural products so as to reduce surpluses of such products and to increase the income of farmers, and for other purposes.

The Department recognizes the worthy contributions and objectives which the bill would make to the agriculture of the United States. We favor the enactment of S. 3503, provided the bill is amended as set forth in the attachment.

The purposes of the bill, as introduced, would be to find and develop through research, new industrial uses, and increased use under existing processes, of agricultural products. The bill would create in the executive branch an Industrial Agricultural Products Administration to carry out the purposes of this act. This Administration would be headed by an Administrator who would receive compensation at the rate of $22,500 per annum. The Administrator would direct the conduct of research and other scientific experiments in an all-out effort to promote the finding, development, and commercial use of new, increased, extended, and perfected processes, techniques, and programs for industrial uses of greater quantities of agricultural products.

S. 3503, as introduced, would authorize the following: (1) The use of existing facilities and personnel; (2) construction of new facilities and hiring additional personnel as needed (all technical and scientific personnel engaged for research would be exempted from civil-service laws and regulations); (3) entry into contractual arrangements; (4) payment of incentive awards; (5) employment of consultants without compensation or at rates of compensation not to exceed $50 per diem; and (6) grants to accredited schools for fellowships and scholarships in research for the purposes of this act.

The bill, as introduced, would create in the Department of Agriculture an Industrial Agricultural Products Agency under the direction of the Secretary of Agriculture. It would carry out under the delegations, directives, and policy determinations of the Administrator, all of the duties, obligations, and responsibilities imposed upon the Administration by this bill.

The introduced bill would authorize, for the Industrial Agricultural Products Agency, an annual appropriation of $100 million beginning with fiscal year 1957. It would also authorize the President to transfer $1 million out of unexpended Agricultural Department funds to promptly initiate the program following the bill's enactment.

There is attached a copy of a redrafted bill which the Department believes would be necessary to get the job done if an all-out effort is to be made to develop new and improved uses of agricultural products through research.

We are opposed to the organizational arrangements proposed in the bill for two reasons: (1) The inherent danger of conflict between the Industrial Agricultural Products Administration to be created in the executive branch of the Government and the Industrial Agricultural Products Agency to be created in the Department of Agriculture; and (2) the apparent duplication of organization and functions between the proposed Industrial Agricultural Products Agency and the Department's Agricultural Research Service which is currently engaged in research similar to that contemplated by the bill. The redrafted bill would eliminate our objections by placing the responsibilities imposed by the act with the Secretary of Agriculture.

It is our belief that for the first year (1957 fiscal year) that the amount to be appropriated should not exceed $50 million, as the implementation of the bill should be at a rate that is consistent with the availability of personnel and facilities. The redrafted bill includes this suggested change.

The suggested bill contains some provisions which are clearly beyond the authority now vested in the Secretary but which, it is firmly believed, must

be included if this activity is to be undertaken at the level suggested and if significant results are to be achieved.

The bill as introduced would exempt from the civil-service laws and regulations all technical and scientific employees engaged in research under the provisions of the bill. The redrafted bill would provide that upon the certification of the Secretary that such action is essential to carrying out effectively the purposes of this act or other acts authorizing utilization research in agriculture, such technical and professional positions as he designates may be filled without regard to the provisions of the Classification Act of 1949, as amended. We consider this provision absolutely necessary to implement the proposed program. This authority would be subject to administrative control within the Secretary's Office and it would be our intention to administer this provision in accordance with governmentwide policy and not unilaterally.

The bill as introduced would permit the making of grants to accredited schools, colleges, and universities for fellowships and scholarships in research for the purposes of S. 3503. Our redrafted bill would permit the making of grants to get direct action in the initiation of this work.

Sincerely yours,

TRUE D. MORSE, *Acting Secretary.*

A BILL To provide for further research relating to new and improved uses which offer expanding markets for farm products, and for other purposes

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

The Congress of the United States hereby makes the following declarations and findings concerning the development of new and improved uses for farm products and for new products to replace those now in surplus:

(a) Farms in the United States have a capacity to produce more farm products than can be marketed at prices that will return sufficient incomes to farmers to maintain an efficient and progressive agricultural industry.

(b) A prosperous and progressive agriculture will contribute immensely to national welfare by efficient production of needed food and fiber, by provision of raw materials for the transportation and processing industries, by purchases of production supplies, and by its contribution to maintenance of a balanced and high-level national economy.

(c) National defense and security interests of the United States require protection of agricultural resources against deterioration and the maintenance of high productive capacity in order to meet possible emergency needs of the United States and other friendly nations.

(d) Research programs to develop new and improved uses for farm products and new farm products have potentialities for providing outlets for a larger volume of farm production. This in turn will result in higher prices and incomes for farmers.

(e) Public and private research agencies, including the Department of Agriculture, the land-grant colleges, other universities, and research institutions, as well as private firms, can and should be utilized for an all-out attack on development of new and improved uses, and new and extended markets and outlets for farm products and byproducts. Research, pilot-plant and developmental work, and corollary economic and related studies should be devoted to the expansion of industrial uses for agricultural commodities in surplus, and to any food and feed uses and replacement crops that can make substantial contributions toward the solution of the surplus problem. Facilities should be established, as needed, to permit adequate experimentation and testing, and production and market development, of promising new uses and new products.

(f) Development of new and improved uses of farm products and new farm products and new and extended markets and outlets for farm products and byproducts will enlarge income opportunities for farmers. It also will reduce Government costs for acquisition, storage, and ultimate disposition of commodities now in surplus.

SEC. 2. The Secretary of Agriculture is authorized and directed to conduct research into the finding of new, increased, extended, and perfected uses for farm products, and of new farm products, and to make laboratory and field studies, test production and marketing procedures on commercial bases, maintain and expand pilot plants where necessary, utilize commercial plants and such other means and methods as the Secretary deems will accomplish the objective of this Act.

SEC. 3. The Secretary of Agriculture shall have the authority within the limits of available appropriations under the Act to carry out the provisions of this Act, including, but without being limited thereto, the authority:

(a) To prescribe such rules and regulations as he deems necessary governing operations under this Act.

(b) To enter into contracts through the means provided in section 10 (a) of the Act of August 14, 1946 (60 Stat. 1085).

(c) To make grants to State agricultural experiment stations, colleges, universities, and private nonprofit research institutions for the conduct of research pursuant to this Act.

(d) To acquire by construction, purchase, lease, loan, or gift, real property needed to carry out the purposes of the Act.

SEC. 4. The Secretary may appoint and fix the compensation of such personnel as may be necessary to carry out the provisions of this Act. Such appointments shall be made and such compensation shall be fixed in accordance with the provisions of the civil-service laws and regulations and the Classification Act of 1949, as amended: *Provided*, That upon the certification of the Secretary that such action is essential to carrying out effectively the purposes of this Act or other Acts authorizing utilization research in agriculture, such technical and professional positions as he designates may be filled without regard to the provisions of the Classification Act of 1949, as amended.

SEC. 5. In carrying out the provisions of this Act the Secretary is authorized to obtain the services of experts and consultants in accordance with the provisions of section 15 of the Act of August 2, 1946, as amended (5 U. S. C. 55a) at rates not to exceed $100 per diem for individuals, and such persons may be allowed travel expenses in accordance with the provisions of section 5 of that Act, as amended (5 U. S. C. 73b–2).

SEC. 6. The Secretary shall report annually to the Congress progress on research programs undertaken pursuant to this Act.

SEC. 7. In the furtherance of the research work authorized by this Act, the Secretary may establish appropriate advisory committees to assist in effectuating specific research programs and may allow traveling and subsistence expenses of such committees in connection with their attendance at meetings called for the purposes of this Act. Appropriations made under this Act shall be available for expenses of such committees.

SEC. 8. There is hereby authorized to be appropriated the sum of $50,000,000 for the fiscal year beginning July 1, 1956, and $100,000,000 annually thereafter. There may be transferred to and merged with any appropriations made to carry out this Act such amounts as the Secretary may determine from appropriations of the Department of Agriculture available for utilization research.

Senator CLEMENTS. Mr. Secretary, both on the basis of time and the fact that Dr. Hilbert is going to discuss the accomplishments of research—I understand he is going to discuss the accomplishments of research up to this time——

Mr. PETERSON. That is right, sir.

Senator CLEMENTS. I shall refrain from asking you any questions in that field.

I have before me a letter dated March 22 addressed to the Secretary of Agriculture signed by the chairman of this committee, asking for a report on S. 3503, which only came forth on July 6. Is there any significance in the long delay in getting a report from the Secretary on this bill?

Mr. PETERSON. I think not, Mr. Chairman. I should say that there are a number of problems, some of which have not been entirely resolved yet, particularly that bearing upon the question of exemption from the Classification Act. There are administrative problems that affect several departments within the Government, and the delay certainly does not indicate any lack of interest on the part of the Secretary of Agriculture in his proposals before the committee.

Senator CLEMENTS. Is it a little unusual to wait that long to give the committee an expression from the Department?

Mr. PETERSON. I cannot say in all instances, Senator. Certainly this is longer than we should like it to have taken.

Senator CLEMENTS. May I ask what action was taken by the Department to get the view of the Bureau of the Budget on this particular piece of legislation?

Mr. PETERSON. We have had quite a number of discussions back and forth, Senator. I think most of those discussions, at least those in which I participated, had to do with the administrative arrangements which the Department has now laid before you.

Senator CLEMENTS. Both Secretary Peterson and the chairman of this committee are right familiar with what the normal procedure is with reference to the Department and the Bureau of the Budget. I think it would be well for the committee to have such information as the Department has with reference to the attitude of the Bureau of the Budget on this bill.

Mr. PETERSON. I can say that so far as the substantive provisions of the bill, Mr. Chairman, are concerned, the Bureau of the Budget is in accord.

Senator CLEMENTS. That is what I would like for you to get for this committee, because it would be very helpful to the committee if you would get that and let us have it for the record.

Mr. PETERSON. I think that can be obtained, Senator.

Senator CLEMENTS. There was no mention of it in your statement. That is what prompted my asking the question.

Mr. PETERSON. I am very happy that you asked the question.

Senator CLEMENTS. Both the Secretary and the chairman of this committee are right familiar with those steps going along together.

Mr. PETERSON. As you well know, there is a problem within the Government in its entirety of obtaining scientific and technical personnel. Studies are under way, so I understand, by the Bureau of the Budget and the Civil Service Commission and other agencies having responsibilities there with respect to the question of salary levels.

We have recommended here that these technical and professional people be exempted from the provisions of the Classification Act. While a policy has not been established governmentwide, we felt this was absolutely necessary if this bill is to be effectively implemented, and we have therefore so recommended, and to my personal knowledge that is the only question that has not been resolved and that held up the report, Senator.

Senator CLEMENTS. The chairman of this subcommittee would be interested in knowing whether the delay between March 26 and July 6 was affected at all by action of the Bureau of the Budget.

Mr. PETERSON. No. I think it would be unfair to say that it was, sir.

Senator CLEMENTS. I think it would be well to clear that up in the statement of transmittal that you give to us from the Bureau of the Budget.

Mr. PETERSON. I am sure that that could be accomplished.

Senator CLEMENTS. The chairman of this subcommittee is not unmindful of the fact that many reports from departments have been held up while they were getting the viewpoint of the Bureau of the Budget. This is not the first one that has ever taken place.

Mr. PETERSON. I should like to reiterate, if I may, Senator, that the Bureau of the Budget raised no objections whatsoever to the substantive provisions of this legislation or to its intended purpose. The question was purely one of interrelationships within the Government on the question of personnel compensation.

Senator CLEMENTS. The committee will be better informed if they have a more thorough statement of the actions that took place between March 22 and July 3 as the Bureau of the Budget was associated with it.

Mr. PETERSON. I shall be glad to get that for the record, sir.

(The statement requested and the report from the Bureau of the Budget are as follows:)

The Department's proposed report on S. 3503 was submitted to the Bureau of the Budget, for review, on June 18. The Bureau then requested the views of the Civil Service Commission on the personnel phases of the bill. On July 3 the Bureau advised the Department informally that it favored the objectives of the bill, but that the Civil Service Commission was not in favor of the provision to exempt employees under this bill from the Classification Act. On July 5, the Department presented to the Bureau of the Budget a modified version of the provision (which was later submitted to the committee in the Department's report of July 6 on the bill). The Bureau of the Budget offered no objection to the submission of our revised report but did not clear the report formally because the Civil Service Commission had not had an opportunity to review the modified provision and hearings were to be held the next morning (July 6).

DEPARTMENT OF AGRICULTURE,
Washington, D. C., July 13, 1956.

Hon. ALLEN J. ELLENDER,
Chairman, Committee on Agriculture and Forestry,
United States Senate

DEAR SENATOR ELLENDER: In our report of July 6, 1956, to you regarding S. 3503, a bill to provide for a scientific study and research program for the purpose of developing increased and additional industrial uses of agricultural products so as to reduce surpluses of such products and to increase the income of farmers, and for other purposes, we proposed a revision of the bill. After further discussion with the Bureau of the Budget, and following consideration of the matter by the Chairman of the Civil Service Commission, this Department recommends that the proviso in section 4 of our proposed revision of the bill be deleted and that the following language be inserted in lieu thereof:

"*Provided*, That the Secretary is authorized to fix the compensatiotn for not more than 100 positions established to carry out the purposes of this act or other acts authorizing utilization research in agriculture which require the services of especially qualified scientific or professional personnel: *Provided*, That the rates of basic compensation for positions established pursuant to this section shall not exceed the maximum payable under the act of August 1, 1947 (61 Stat. 715), as amended and supplemented, and shall be subject to approval of the Civil Service Commission. Positions created pursuant to this section shall be included in the classified civil service of the United States, but appointments to such positions shall be made without competitive examination upon approval of the prospective appointees' qualifications by the Civil Service Commission or officer or agents as it may designate for this purpose."

On this basis, the Bureau of the Budget advises that it would favor the enactment of the proposed legislation and that there is no objection to the submission of this report.

Sincerely yours,

TRUE D. MORSE, *Acting Secretary.*

Senator CLEMENTS. There is one question I would like to ask, and it is not exactly related to this. We have heard a great deal through the years and through the late months about there being $1 million a day storage charges, and my friend from Indiana mentioned that

$365 million in storage charges. Whatever the storage charge might be on the Government, is or is not a part of that storage charge recovered by the Government when some of the surplus stocks are sold?

Mr. PETERSON. I cannot answer that of my personal knowledge.

Senator CLEMENTS. I would like for you to do this. I would like for you to provide this committee, since it has been placed in the record, and it ought to be clear for the record, what the storage charges have been on the Treasury and what part of them has been recovered or is recoverable by the Government.

Mr. PETERSON. I shall be glad to ask our people to prepare a statement.

(The statement referred to follows:)

STATEMENT FILED BY THE DEPARTMENT OF AGRICULTURE ON RELATIONSHIP OF STORAGE AND OTHER ADDED COSTS TO COMMODITIES DISPOSED OF UNDER THE PRICE SUPPORT PROGRAM

Storage, handling, transportation and other costs are added, as incurred, to the inventory value of the commodities on hand. When a quantity of a commodity is sold or given away, the cost value of the disposition is predicated upon all costs; that is, cost of initial acquisition plus all added charges applicable to that quantity. The difference between the total cost value at disposition and the amount of proceeds received represents the net gain or loss. Any capital restoration authorized by Congress from funds in the Treasury is based in part upon this net realized gain or loss which reflects all of the cost and price factors involved in handling and merchandising commodities.

The price at which a commodity is sold under the price support program is not normally determined by the accumulated cost to CCC, and for that reason there is no practicable basis for determining what portion of the sales proceeds represents recovery of storage costs as differentiated from any other element of the total cost. The approximate relationship of added charges to costs of dispositions and to net realized gains and losses under the price support program for the fiscal years 1954, 1955, and 1956 is shown in the following table:

Dispositions under CCC price-support program

[In millions of dollars]

Price-support program	1954 actual	1955 actual	1956 estimated [1]
Cost value at disposition of commodities sold	1,374	1,697	2,350
Cost value at disposition of commodities donated	50	418	350
Total cost value of all dispositions	1,424	2,115	2,700
Approximate amount of storage, handling, transportation, and other added charges included in total cost value of all dispositions	(224)	(355)	(375)
Sales proceeds	1,006	1,340	1,622
Net realized loss on dispositions	418	775	1,078

[1] 11 months actual, 1 month estimated.

Tobacco placed under the price-support program is handled somewhat differently from other commodities. The tobacco generally remains in a loan status until sold by the cooperative association acting for the producer, and all charges for storage are added to the loan balance. If the proceeds of all sales of tobacco pledged by a particular association from any one crop-year are sufficient to discharge the loan balance plus interest, there is no loss to the Corporation; therefore all storage charges are recovered. If the sales proceeds are not sufficient to discharge the loan balance, the remainder represents a loss to the Corporation, and there is an undetermined element of storage charges contained in this loss. The net result of the tobacco price support program from inception through May 31, 1956, has been a gain of $339,444.

Senator CLEMENTS. My State produces a good deal of tobacco, and there is a good deal of tobacco in storage, but you and I know that in the case of practically all of the tobacco that has been stored, the cost of storage was recovered when the tobacco was sold.

Mr. PETERSON. That area of responsibility in the Department is outside of my immediate responsibility. I am sorry I do not have that information for you.

Senator CLEMENTS. Mr. Secretary, I appreciate that. But since that has been raised, I would like to have it cleared.

Mr. PETERSON. I will be glad to ask the Commodity Credit to furnish it for you.

Senator CLEMENTS. Senator Capehart, is there any question that you would like to ask?

Senator CAPEHART. I do not want to ask a question. I just want to make a comment.

Whether that storage charge is recovered by the Government, it is a cost. So whether it is recovered or not, it is an added cost to the goods.

But I would like to know that information, too, as to how much of it is recovered. Still, even though it is recovered, it still cost somebody $365 million.

Senator CLEMENTS. Reference is always made to the costing the Government $365 million, or $1 million a day, and if that is a fact, the record ought to show it.

Senator CAPEHART. Yes.

Senator CLEMENTS. And if there are some deductions from it, the record ought to show that.

Senator CAPEHART. At least, that figure has been used continuously now for a long time.

Senator CLEMENTS. The reason I asked it was that I thought the Secretary was in fine shape to give that information.

Senator CAPEHART. We would all like to know that.

Senator CLEMENTS. Yes, we would all like to know that.

Senator CAPEHART. And I would like to know how much is recovered when we sell the goods. I would like to know that.

Senator CLEMENTS. Come around, Mr. Hilbert.

Mr. Secretary, we shall be glad for you to remain with us.

Dr. Hilbert is the Director of the Utilization Research.

STATEMENT OF DR. G. E. HILBERT, DIRECTOR OF UTILIZATION RESEARCH, AGRICULTURAL RESEARCH SERVICE, UNITED STATES DEPARTMENT OF AGRICULTURE

Dr. HILBERT. Mr. Chairman, I appreciate meeting with you today and having the opportunity of describing some of the contributions made by the regional research laboratories in developing new and extended uses for farm crops. First, I would like to review briefly the work done by the Government in this general field before the regional laboratories were established.

The first work in agricultural chemistry was carried on in 1841 in the Agricultural Division of the Patent Office. The Department of Agriculture entered into operation on July 1, 1862, and replaced the Agricultural Division of the Patent Office.

At the same time, the Division of Chemistry was established as the first scientific unit of the newly created Department of Agriculture. The group in the Chemical Division was very small until after Dr. Harvey W. Wiley became its Chief in 1883. He held this office for 28 years.

During this period, the personnel of this unit grew from 3 to over 500. The major attention of the group, however, was devoted to the purity of foods and drugs rather than utilization research. These activities led to the enactment of the Food and Drugs Act of 1906. By this time the Division of Chemistry was raised to the rank of a bureau. Much of the work of the Bureau of Chemistry with the passage of this act was shifted to regulatory activities.

In the reorganization of the Department in 1927, the function of enforcing this act was transferred to the Food, Drug, and Insecticide Administration. In this change the Bureau of Chemistry was renamed the Bureau of Chemistry and Soils.

After the reorganization, about 100 research workers from the former Bureau of Chemistry continued their efforts to seek more knowledge on the chemistry, processing, and utilization of farm crops. In the thirties increasing attention was devoted by the Bureau of Chemistry and Soils to research on the utilization of farm crops.

The first major expansion in the Department of Research on the utilization of farm crops came with the establishment of the four large regional research laboratories. These laboratories were established in New Orleans, La.; Peoria, Ill.; Albany, Calif.; and Wyndmoor, Pa.

The legislation authorizing the four regional laboratories was contained in the Agricultural Adjustment Act passed in 1938. One section of the bill stipulated that the purpose was

> to conduct research into and to develop new scientific, chemical, and technical uses and new and extended markets and outlets for farm commodities and products and byproducts thereof.

Further:

> Such research and development shall be devoted primarily to those farm commodities in which there are regular or seasonal surpluses.

That was the charter. It represented a new front of attack in the general program of the Government on the major agricultural surplus problems which then existed. In essence, too, it represented a major challenge to science and technology to aid in solving this farm problem.

Congress gave the Department a great deal of flexibility in the development of the program and in the choice of problems. In the overall program, however, Congress requested the Department to investigate thoroughly two problems: the alcohol motor-fuels problem, and the use of cotton in tire cord. These two problems were controversial ones during the late 1930's.

Farm interests were urging the conversion of surplus grains for the production of alcohol for use in motor fuels. The petroleum industry on the other hand claimed the use of alcohol in motor fuels was impracticable and that alcohol was a poor motor fuel. Farm organizations contended otherwise.

A similar controversy was being waged between the cotton interests and the rayon industry in the use of cotton in the fabrication of tire cord. The rayon industry claimed that rayon was much superior

to cotton. Rayon at the time was rapidly replacing cotton in the tire-cord market. This was a serious blow to the cotton industry. Tire cord represented one of the largest single outlets for cotton. The quantity of cotton used in the production of tire cord was equivalent to about 600,000 bales of cotton.

Due to the controversial nature of these problems, and to the many claims and counterclaims being made, Congress believed that the Department should get the facts in the matter. As a result, a large team of 50 scientists, representing one-third of the entire group on the cotton program, devoted its attention to the tire-cord problem. An equally large team attacked the alcohol motor fuels problem.

Just as we were well started on our research program, World War II intervened. The emphasis of our program was then shifted to defense purposes. Most agricultural surpluses, because of war needs, were wiped out very quickly. Instead of finding uses for surpluses, we were confronted with the situation of conducting research on extending existing supplies, developing substitutes, conducting research on dehydrated foods for use by the armed services, and many other activities.

For example, the War Production Board requested us to develop high-speed equipment for cutting high-priced cotton lint into lower-priced linters. Cotton lint was in large supply and linters in short supply, being in demand for the production of explosives. The War Production Board also requested us to coordinate all research work underway on the conversion of wheat to alcohol for use in the synthetic-rubber program. Normally, wheat is too high-priced to be competitive with other raw materials for this purpose.

At the end of World War II, we again resumed our long-term program on developing new and extended uses for surplus crops.

In 1950, with the outbreak of Korean hostilities, our program again was shifted to defense activities. In 1953, we redirected our investigations to the surplus problem.

It is evident that during the past 15 years approximately half of our time has been diverted from the surplus problem to defense activities. However, this has not been altogether unfavorable. The speed with which some of our developments were translated into industry was accelerated because of the urgency and need for the products we developed. Some commodities were benefited by these activities, such as cotton, fruits and vegetables, and oils and fats. Our program on corn and wheat, however, was retarded by this defense work.

I would like now to describe some of the major contributions made in this program.

There are two types of surpluses—seasonal surpluses of perishable commodities, and annual surpluses of stable commodities. First, I will discuss the perishable group which, of course, includes fruits, vegetables, and eggs. Most of our research on this class of commodities has been directed toward the development of methods for converting them to a stable, palatable, convenient-to-use form so that they are preserved and available throughout the year. This conversion to a year-round product tends to stabilize the price of these commodities. Foods in a convenient-to-use form provide an incentive for the housewife to purchase them.

The Department and the Congress can take justifiable pride in the part played by Federal research in the genesis and growth of the great

frozen-food industry. We sometimes forget that frozen foods, as millions of Americans now know them, first appeared in a few markets in the early 1930's, and that this billion-dollar industry first stood on its feet during the great depression. In a striking example of farsighted vision of needs and opportunities, the Department established a special laboratory in Seattle at the critical moment in the year 1930 and staffed it with vigorous, farseeing scientists. There was already a considerable industry in that area engaged in freezing berries and some other fruits in large containers for use by ice cream manufacturers and commercial pie bakers. Experimentation with the freezing of fruits and vegetables in small packages for the retail trade was going on in a number of places. Results were uneven; often definitely unsatisfactory. The soundness of the whole future structure was in balance; the successful outcome is history.

Improvements in quality and in lowering processing costs did not end with the pioneering feat of the Frozen Pack Laboratory in Seattle. With the establishment of the regional research laboratories, our program on frozen foods was accelerated. Many contributions have been made in solving the new problems that were arising continually from the enormous growth and diversification of an industry that has become a major channel for utilization of many of our food commodities.

Senator CLEMENTS. Did I understand you to say that this action in Seattle was an action by the Department of Agriculture?

Dr. HILBERT. That is correct.

Senator CLEMENTS. And where was it conducted in Seattle? Did the Department have a contract with some agricultural agency there?

Dr. HILBERT. The Department had a small field station located on the outskirts of Seattle and this research was conducted at that small laboratory by Federal scientists.

Senator CLEMENTS. It would be fine for the record if you would give us a little more detail on that operation, going into the facts a good deal further than the creation of your four experimental laboratories. I would like for you to provide for the record more detailed information about that operation.

Dr. HILBERT. I would be glad to do so.

Senator CLEMENTS. It may be that it would not provide the committee with any information that has any particular bearing on this, but I think that it would be good history for the record to have it.

Dr. HILBERT. I would be glad to submit that for the record.

I might say that this group at the Seattle laboratory was transferred to the Western Utilization Research Laboratory when it was established and, because of larger funds, we were able to accelerate that program.

Senator CLEMENTS. I think that it would be good to have more detailed information.

Dr. HILBERT. Yes, Mr. Chairman.

(The statement referred to follows:)

STATEMENT FILED BY THE DEPARTMENT OF AGRICULTURE ON FROZEN-PACK RESEARCH

The 1932 Agriculture Appropriation Act provided an increase of $14,000 for investigations of the handling, storage, and utilization of fruits and vegetables by frozen-pack methods. Prior to that time some preliminary research had been undertaken on these problems at seasonable intervals.

With the increased funds the United States Frozen Pack Laboratory was established in 1931 at Seattle, Wash., at the Spokane Street Terminal. The initial staff consisted of two scientific workers with appropriate subprofessional staff as required.

The increase was provided because the rapidly growing frozen-pack industry had developed within a few years to an investment of many million dollars. It was furnishing an outlet for fruit and vegetable growers in highly specialized producing areas, and at the same time furnishing a means of getting better flavored fruit and vegetables into consumers' hands and to the ice-cream industry, jam factories, etc.

However, the rapid expansion of the industry had brought many problems requiring research to provide for sound commercial operations since losses were of considerable magnitude.

The new laboratory undertook studies on (1) the most desirable varieties adapted to preservation by frozen pack; (2) determination of the best stage of maturity for harvesting the crops; (3) best methods of handling crops in the field and at the packing plant; (4) most desirable types of pack; (5) best methods of refrigeration; and (6) causes and prevention of spoilage during storage and in subsequent handling. Field studies were conducted in cooperation with farmers, and packers.

The work proved of great use to the rapidly expanding frozen-food industry which was faced with complex problems of setting quality standards, choosing suitable varieties, distributing a product requiring frozen storage and many others. In 1940 the laboratory was moved to Albany, Calif., to become the nucleus of the commodity processing division of the Western Regional Research Laboratory. From this has grown much of the extensive and fruitful food research program of the present Western Utilization Research Branch of the Agricultural Research Service.

Numerous publications have been issued reporting the results of frozen-pack research, and numerous articles have appeared in technical journals, farm magazines, trade publications, etc. They have covered all phases of the many problems of the frozen-pack industry—variety, stage of maturity at harvest, bacteriological problems encountered in packing, etc. Work has been done with peas, corn, strawberries, peaches, and other fruits and vegetables.

Dr. HILBERT. Not only the frozen food industry of the Northwest, but also the entire industry has acknowledged on many occasions the debt it owes to the scientists and technologists of the Department. These men tackled problems that were entirely beyond the powers of the industry, found the answers, and by precept and example, showed the industry how to meet them.

Another important contribution we have made in this field is on the development of frozen concentrated orange juice. At the end of World War II, the industry was deeply concerned that it would be faced with serious orange surpluses. There even were discussions on the possible need for Government price supports. In 1943, our Winter Haven laboratory, in cooperation with the Florida Citrus Commission, developed the basic process for producing frozen concentrated orange juice. The patent on this process was dedicated to the Secretary of Agriculture for use by industry on a royalty-free basis.

The citrus processing industry had the vision to follow through vigorously on this development. The produce has been widely accepted by consumers because it can be stored for more than a year, is convenient to use, and when properly processed and marketed has practically the same flavor and quality as fresh juice. The industry has mushroomed since that time, and the expanded production of oranges has been absorbed without difficulty. This development has thus prevented a surplus problem from arising. At the present time, no less than 50 percent of all Florida oranges produced are converted into frozen concentrated juice.

This development has stimulated the production of other frozen concentrated fruit juices. Some of these are frozen concentrated lemon, lime, tangerine, grapefruit, grape and apple juices. Of these, frozen lemonade concentrate has been particularly well received, and its production has increased markedly in the past few years. It has had a helpful stabilizing effect on industry.

Fruit and vegetable juices also can be converted into another stable, palatable, convenient-to-use form, and that is as powders. During World War II, fruit and vegetable powders were produced extensively for the armed services; however, the products had lost much of the flavor of the original juice, and dissolved very slowly in water. The process we have developed yields powders which have the full flavor of the original raw product. Orange, lemon, grapefruit, apple, prune, grape and tomato powders now can be made. Due to the excellent storage stability, these powdered juices can be stored on the kitchen shelf with other staples and can be reconstituted quickly by the addition of water—even ice water.

A great deal of commercial interest has arisen in fruit and tomato juice powders. A plant in Florida has been producing orange juice powder for a year and a half. The construction of a plant for the production of tomato juice powder was completed a few months ago and is making preliminary commercial runs to produce tomato juice powder. Two companies are producing pineapple and lemonade juice powders on a pilot plant scale. This development has great promise and is expected to have a tremendous impact upon our fruit and vegetable industry.

The commercialization of potato granules, or instant potato, has moved ahead rapidly in the last 2 years. The knowledge we have developed in increasing the storage life of instant potato and in developing equipment for its production has been responsible for the success of this development.

The instant potato now being produced can be converted quickly and conveniently into the mash form in the kitchen. The mashed potatoes are indistinguishable from the product made with fresh potatoes. Five companies which have adopted our findings are now producing this form of dehydrated potato. The domestic demand is so great that the industry has been having difficulty in supplying the market. This industry will continue to expand. We believe this development will do for the potato industry what frozen concentrated orange juice has done for the citrus industry.

The same is true of eggs. The egg industry has been faced with seasonal surpluses periodically. Preservation of eggs by freezing has been practiced widely and is helping to stabilize the market. Powdered eggs that can be stored and still be as palatable as fresh eggs is quite a recent development. All of us remember the dehydrated eggs that were available during World War II; they simply did not stand up in storage. Several years ago, we discovered the cause of the rapid development of off-flavors in dried eggs. Through appropriate processing and drying we have overcome this difficulty. Several companies are now producing this improved type of dried egg powder. It is being used by the Armed Forces and commercially, particularly in the manufacture of baking premixes. The production of dried

eggs has been averaging about 20 million pounds a year. This development is making a significant contribution toward stabilizing the egg industry. There is still one problem to be solved, and upon which we are working—that is to produce the dried egg powder in a convenient-to-use form. Such a convenient-to-use form of egg has promise in home use, particularly in the preparation of scrambled eggs.

I would like to discuss now the contributions we have made on storable surplus commodities.

The first one I will take up is cotton. Earlier, I mentioned that in the first years we devoted a great deal of attention to the use of cotton in tire cord. I would like to summarize our findings for you. Our work showed that cotton is just as good as rayon for making most tire cord. In actual road tests, we showed that the life of cotton cord is as good as that made from rayon when used in tires for passenger cars and light trucks, and in medium-size heavy-duty tires for military trucks. However, the price of rayon cord is cheaper than that made from cotton.

The fundamental work we have done on cotton, however, has aided the use of our cotton in tire cord made in France. One French company using 40,000 bales of Egyptian cotton annually replaced this with our own Delta cotton a couple of years ago. The French company discovered that certain variaties of our own Delta cotton worked as well as Egyptian cotton. However, the company did not have any simple method for selecting the varieties of Delta cotton which are most suitable in tire cord. On the basis of the fundamental information we had developed, we were able to provide the company with a simple test method for selecting these cottons.

Perhaps the most significant contribution we have made in cotton is in the developing of new equipment for lowering the cost of processing cotton in textile mills. Before cotton can be processed, the matted or compacted masses of fiber in a bale must be opened and fluffed to enable more efficient removal of the foreign matter from the fiber. A new cotton opener which we developed several years ago does this better than any other.

With our machine, more trash, but less spinnable fiber, is removed in the processing operation. Savings are estimated by industry to amount to 50 cents to $1 per bale of cotton processed. The textile industry has already put into use enough of these machines to process 2 million bales of cotton annually, and new machines are being installed at a rate to handle an additional 500,000 bales each year. The basic patents on this opener have been dedicated to the Secretary of Agriculture. Four United States, and several foreign companies, are manufacturing these openers.

We have made other improvements on equipment used in the processing of cotton. We have developed a simple attachment to a loom which permits the weaving of abnormally dense cotton fabrics having resistance to the passage of water and wind. The loom attachment we have developed is being produced commercially by two manufacturers.

By a thorough study of the carding of cotton, we have found how cotton card production can be increased greatly—by as much as 60 percent. The card is a standard piece of textile equipment in every textile mill; it disentangles individual cotton fibers and brings them

into parallel alinement. In addition to increased production rates, it was found that waste in carding can be reduced about 1 percent. A number of mills have adopted our recommended changes in carding techniques. One medium-sized mill reported to us an estimated savings of about $170,000 a year.

We have done a great deal of work on improving the life of cotton fabrics with regard to resistance to the effects of weather, mildew, sunlight, and heat. The service life of cotton cloth used to shade seedbeds and growing tobacco plants can be tripled by the process we have developed. This tobacco shade cloth is being produced commercially by two companies and is being used widely at the present time. This development has helped prevent displacement of cotton fabrics by those made from synthetic fibers.

Entirely new fibers with new and improved properties have been prepared from cotton by chemical modification. One such new product is acetylated cotton. It has higher resistance to heat than cotton and most synthetic fibers, and is used in laundry press covers, and ironer roll covers in commercial laundries. Two firms are now manufacturing this new textile product.

One of the disadvantages of cotton fabrics has been the problem of soiling. We have developed an antisoiling treatment which involves the use of a simple and inexpensive compound in laundry rinse waters. This makes cotton goods harder to soil and easier to clean. Preparations of the antisoiling compound are being manufactured by at least five companies for use as antisoiling treatments for cotton both at home and in commercial laundries.

An elastic, conforming, clinging cotton bandage developed by us during World War II, and produced commercially for the Armed Forces beginning in 1952, has now been made available for general civilian use. Two companies are actively producing and marketing the product.

Because of the lack of uniformity in cotton fibers, it is necessary to have accurate methods of measuring their properties in order to determine their best end usage. A number of new instruments have been developed and are in use for these purposes. A new dye technique for distinguishing between immature and mature fibers has been of great help to the industry in pinpointing processing problems. The relationship between length and strength of cotton fibers and the spinning of more uniform yarns has been appraised accurately and summarized in convenient-to-use charts for textile mills.

All these developments help to reduce processing costs and improve the quality of cotton fabrics, thus placing the cotton-textile industry in a better competitive position with respect to synthetic fibers and aiding the cotton producer by retaining the markets for his product.

The next subject I will discuss is our contributions on fats and oils. Since the end of World War II production of oils and fats in this country has increased 50 percent, while consumption has increased only from 10 to 15 percent. The price of oils and fats has fluctuated quite widely during this period. Between 1950 and 1952 the price of inedible fats and oils, because of oversupply, dropped as low as 3½ cents per pound. Because fats and oils are interchangeable for most uses, a surplus of one fat or oil affects the price structure of all fats and oils.

The largest new use we have found for inedible fats is in the feed field. When the price of these fats dropped to 3½ cents a pound, inedible fats actually were cheaper, on a calorie basis, than almost any other feed. Before they could be used in feeds, however, it was necessary to show that fats in feeds had value, and that the fat could be stabilized suitable for such a purpose; this we showed. As a result of this research, the use of inedible fats in the feed industry expanded rapidly. The present annual consumption of fats in feeds is now about 250 million pounds. This expanded use for fats has been responsible largely for the increase in price of inedible fats from 3½ to 7 cents a pound.

Other new markets for inedible fats have been developed in the chemical industry, in the plastics industry, and in the hot-dip tinning of steels. Basic research on the development of improved grades of oleic acid has been translated to a commercial scale. Basic methods for the modification of oils and fats have resulted in their use as plasticizers or as stabilizers in plastics. From the earliest days of hot-dip tinning, imported palm oil has been used for this purpose. The work we have done and confirmed by pilot plant and full mill-scale operations demonstrated that modified inedible tallow and greases perform even better than palm oil.

During World War II, we developed a new resin from soybean oil. This has been produced on a commercial scale for more than 10 years. It is used for the heat-sealing of glassine paper and other food-packaging materials. Recently, a paint company showed that the use of this resin in paints leads to the production of a gelled paint. More than 30 companies are now using the resin to manufacture gelled paints.

About 60 million pounds of fats and oils are now being used by industry for these various new uses.

During World War II, soaps made from tallow and grease were used as emulsifiers in the manufacture of synthetic rubber. In the early days of the industry, frequent variations in the rate of formation of rubber indicated that unknown substances in the soaps were acting as retarders. As a result, industry gave consideration to the use of synthetic emulsifiers. Our research work showed a way to overcome the difficulty with soap. This market for inedible fats was thus retained. About 25 million pounds of tallow are being used currently for this purpose.

We have also made marked advances in improving the quality and storage life of soybean and cottonseed oil. The changes we have recommended in the processing of oilseeds have been adopted by industry. As a result of improvements in the processing of cottonseed meal, about 250,000 tons of cottonseed meal went into mixed feeds for poultry and swine in 1954—a market heretofore closed to cottonseed meal. The meal sold for this market brought a premium of several dollars a ton.

These various contributions have led to improvements in the processing of oilseeds, in improving the quality and storage life of the oils, and to the development of large-volume outlets for surplus fats and oils.

The next topic I will cover is our research work on corn and wheat. Earlier I mentioned that one of our major activities on cereals involved the production and use of power alcohol. From these investigations valuable information was obtained on lowering the cost of the production of alcohol from grains. Our work has shown also that alcohol is an excellent motor fuel either as a blend or by direct injection into the motor. Alcohol-gasoline blends containing 10 to 25 percent alcohol can be used by engines of current model cars and tractors without loss in general performance, provided the fuel is properly blended. Alcohol has definite antiknock value and its wholesale fuel value in a 10-percent blend with gasoline is estimated to be about 24 cents per gallon. To produce alcohol competitive with gasoline, grain would have to sell at from 30 to 45 cents per bushel depending upon the size, location, and efficiency of the plant.

We know now that there is no technical problem in producing power alcohol from grain, and no technical problem in using it as a liquid fuel. We know, also, that the use of grains for the production of power alcohol literally would burn up any conceivable surplus we could have in this country. The key problem in this whole matter is the economic one.

Our defense activities during World War II and the Korean hostilities of necessity shifted much of our attention from the development of large-volume outlets for grains to problems of national significance. Two important contributions resulted from these studies: One was on the production of penicillin, and the other on dextran, a blood-plasma supplement.

The basic process for producing penicillin which we developed during World War II was adopted immediately by industry and is still in use. The basic patents on the production of penicillin were dedicated to the Secretary of Agriculture for use by industry on a royalty-free basis. For this contribution our Northern Utilization Research Branch received one of the Lasker medical awards.

The process we developed, and the micro-organism we discovered for producing dextran during the Korean hostilities, has been taken up by industry. Large quantities of dextran made by our process have been stockpiled by the Department of Defense. A number of years ago civilian hospitals began to use dextran as a blood-plasma supplement.

Both of these accomplishments are of greater significance nationally than from the standpoint of the contribution they have made in developing new outlets for surpluses. Although agricultural raw materials are used in producing penicillin and dextran, the quantities are relatively small. From the national standpoint, however, these contributions have been of inestimable value.

Several new fermentation uses for corn which we developed have been commercialized. A new outlet for corn is its fermentation to produce a feed rich in the vitamin riboflavin. A number of companies are using this process now. Approximately one-half of the current production of vitamin B–12 is produced by new fermentation methods which we discovered. Another process concerns the production of vitamin B–12 and an antibiotic which produces favorable growth responses. This also has been translated to a commercial scale. The

ready and economic availability of vitamin B–12 for chick and swine nutrition has contributed greatly to the more efficient production of these important farm commodities. It has been an important factor in their expanded production. This, in turn, has resulted in increased utilization of large quantities of corn.

Processes which we have developed for the production of calcium gulconate and sodium gluconate have also been adopted by industry. Sodium gluconate is being produced in increasing quantities for use in the clarification of detergent solutions used in the bottle-washing industry.

A process which we have developed for producing a new type of protein fiber from corn gluten was commercialized several years ago. This new type of fiber, called vicara, is being produced in large quantities and has properties quite similar to cashmere.

Our research, done in cooperation with private breeders and the Iowa State Experiment Station, has led to the introduction of a new type of corn called waxy corn. Waxy corn produces a unique type of starch which is finding increased use in the pudding and adhesive industry. Several million bushels of this corn are now produced in the Middle West, and its production is expanding.

In part, because of our defense activities, less progress has been made on wheat than on any of the other commodities upon which we have worked. During World War II our research was concerned with extending the uses of wheat in established industries. For example: We developed a process for separating wheat flour into gluten and starch. A number of companies used our process for producing dextrose from the starch. This dextrose was used as an extender for cane and beet sugar which were in short supply. After the war when dextrose from corn and sugar were freely available, the production of a sweetener from wheat ceased. We were requested by the War Production Board to coordinate all activities on the production of alcohol from wheat. The alcohol was used for the production of synthetic rubber. More than 150 million bushels of wheat were used for this purpose. This operation also stopped after the war when our need for feeding Europe was great.

Within the last 2 years we have shifted major emphasis to the development of new and expanded food and industrial uses of wheat. Dr. Maclay, chief of our NURB, will elaborate upon the progress that has been made on this problem.

At the time the regional laboratories were established, it was impossible, of course, to predict the results that would stem from this research. Some groups, then, believed that little in the form of accomplishments would issue from these laboratories. In the report of the survey made by the Department of Agriculture relative to the four regional laboratories, published in 1939 as Senate Document 65, it was pointed out that—

> all research work is founded upon the faith that, in the long run, knowledge is a better guide to human action than ignorance.

The regional laboratories have been in operation more than 15 years. We are now in a position to assess their contributions. I have called many of these to your attention. Because of the limited time

for my presentation, it has not been possible to describe all of them. I have not discussed our contribution on rice, gum rosin and turpentine, hides and skins, alfalfa, maple sirup and honey, wheat straw and corncobs, tung nuts, and cane and beet sugar. All told, more than 100 of our contributions have been commercialized. In addition to these, many fundamental contributions have been made in expanding our knowledge in the field of science.

These are of great, although intangible, value. This kind of information provides the building blocks for future contributions by research scientists in other organizations as well as our own. It is an investment upon which we will receive dividends for many years to come.

In summary, the Department believes that the return to the farmer and the Nation from this utilization research work has much more than offset the cost of the program. We also believe that if the funds available for this research had been larger, our contributions would have been commensurately greater.

Drs. Maclay, Fisher, and Copley, the Chiefs of our Northern, Southern, and Western Utilization Research Branches, respectively, and Dr. Hoover, Assistant Chief of our Eastern Utilization Research Branch, will now describe to you current progress at each of the regional research laboratories and the promise this holds in developing new and extended uses for farm crops.

Senator CLEMENTS. Thank you, Dr. Hilbert.

Regardless of how many questions I might like to ask you at this time, the hour of 11:46 or 11:47 has arrived and it is necessary for me to go to the floor. I will do my best to be back and reconvene the hearings at 2 o'clock.

I would like to suggest to the many witnesses who appear from the several research stations that if they have statements they would like to present for the record, Mr. Mouser or Mr. Kendall, both of whom are here, will be glad to receive those statements, because I think it is clear to all of you that there will be little time left after we hear the chiefs of these various research groups here today, and I think it is very, very important that we hear them, and I do not think that anybody here is present that does not think preference should be given to these men in presenting their experiences in their work at these research stations.

I shall not stay to receive any of those statements but, again, any of the witnesses or anyone who is not scheduled to testify who has statements that they wish to make, why, the committee will receive them in the record.

I regret very much that it is necessary to leave, but I think that all of you can understand the necessity for my doing so at this time.

(The prepared statements of the American Farm Bureau Federation and the National Council of Farmer Cooperatives are as follows:)

STATEMENT FILED BY JOHN C. LYNN, LEGISLATIVE DIRECTOR, AMERICAN FARM BUREAU FEDERATION

The American Farm Bureau Federation is very happy to present its views with regard to S. 3503. Farm Bureau has had a long and continuing record in support of adequate appropriations for agricultural research, both at the National and State level.

Quoted below is the pertinent section of our 1956 policy dealing with this matter—

"Research is vital to the economic future of agriculture. Farm families are today experiencing a cost-price squeeze. Our research program must be directed toward (1) expansion of markets by finding new uses for agricultural commodities and by promoting better nutrition, (2) lowering production and marketing costs, and (3) improving the quality of agricultural products. Such research must be directed toward the practical needs of farm families."

Certainly the members of this committee need not be reminded of the surplus situation existing in agriculture at the present time. We have supported legislation designed to adjust the agricultural production plant. But at the same time we must have programs designed to utilize—effectively and to the maximum extent possible—both the surplus agricultural commodities which we now have on hand and those that will be available in the future.

In 1955 the American Farm Bureau Federation and other agricultural organizations and commodity groups developed a 5-year program for increased research for agriculture. This program provides for an increase of $18 million per year over a 5-year period for agricultural research, with primary emphasis on marketing and utilization research.

We commend the Congress for substantially increasing the appropriations for agricultural research for fiscal 1956 and 1957. However, we are sure that you will agree that the appropriated sums are very modest in view of the scope of the agricultural problem, especially when compared to the funds being spent by Government and by private industry in developing and finding new uses for industrial commodities. For example, it is estimated that the producers of synthetic fibers are spending upward of $60 million annually for research to improve these synthetic fibers so that they can more adequately compete with natural fibers. It is estimated that industrial research has expanded slightly more than 10 percent per year since the end of World War II. Certainly, if agriculture is to keep pace with industry, we must give added emphasis to research designed to help solve the many problems in agriculture.

We believe that S. 3503 is a step in this direction. It can help to find a solution to our surplus agricultural problem by giving added emphasis to expanded research for industrial use of agricultural commodities. The action of the A. F. B. F. board of directors on June 28, 1956, in carrying out the overall policy stated above dealing specifically with S. 3503, is as follows—

"Farm Bureau has long advocated a program for expanding research for agriculture with special emphasis on utilization. We favor a program for increased research to find new uses for agricultural commodities with an authorization for adequate appropriations.

"We recommend that the expanded effort for industrial use of agricultural commodities be carried out through the Agricultural Research Administration of the United States Department of Agriculture.

"We further recommend the appointment of a Deputy Administrator in the Agricultural Research Service to head up this work.

"Farm Bureau will continue to be interested in a long-time research study for the development of new uses for agricultural products."

It will be noted that our policy differs slightly from the provisions of S. 3503. However, we believe that there is little difference between our policies in this regard and the intent of the authors and sponsors of this legislation.

S. 3503 provides for an Industrial Agricultural Products Administrator who, as we interpret the bill, would be outside the Department of Agriculture. At the same time the bill would create, under the direction of the Secretary of Agriculture, an Industrial Agricultural Products Agency which would carry out policies as determined by the Administrator. We support the establishment of the Industrial Products Agency within the Department of Agriculture and recommend the appointment of a deputy administrator to the Agricultural Research Service to head up this work. We believe, with proper direction by the Congress, that the objectives of this bill can be accomplished in a far more effective manner by utilizing to the fullest extent the Agricultural Research Service in the Department of Agriculture, the regional experiment stations and laboratories, and the land grant college facilities that are available to work on this very important matter. We recommend, therefore, that the Secretary of Agriculture be given the responsibility for carrying out the provisions of this legislation.

We do not have sufficient information to judge whether or not the $100 million authorized by this bill is the proper amount. It may be that thorough study,

and investigation by the Commission provided for in section 209 of Public Law 540, the Agricultural Act of 1956, passage of which we supported, will show that the authorization in this bill will not be adequate to meet the needs. Therefore, as a suggestion to the committee, we recommend that ample funds be authorized under this legislation to carry forward the necessary research for increased industrial use of agricultural products pending the recommendations of the Commission, which are scheduled to be presented to the Congress not later than June 15, 1957. In making this recommendation, we are not suggesting that this bill be held in abeyance pending the findings of the Commission. Instead we are suggesting that, to be certain that adequate funds may be made available, the Congress may wish to avail itself of the information in the Commission's report before any final determinations are made.

We commend the authors of this bill and the Committee on Agriculture for throwing a spotlight on the agricultural problem and suggesting a positive program for increasing agricultural research on industrial uses of agricultural commodities. We believe that with proper implementation that there can be found many new uses for agricultural commodities in industry and that we can expand the current utilization of agricultural commodities.

STATEMENT FILED BY HOMER L. BRINKLEY, EXECUTIVE VICE PRESIDENT, NATIONAL COUNCIL OF FARMER COOPERATIVES

The national council vigorously supported the enactment of the Research and Marketing Act of 1946, and has consistently urged the aggressive administration of its provisions in the Department of Agriculture. Our people have participated in the work of the overall research policy committee and the commodity advisory committees and have supported the reorganization of the Department agencies to bring their services and facilities directly to bear on the marketing and utilization of agricultural products. We have consistently and aggressively supported increased appropriations from year to year for that purpose.

The total amount spent on agricultural research probably approximates a quarter to a third of 1 percent of the value of agricultural production, and probably more than three-fourths of this has gone into production research, as distinguished from marketing and utilization research. Thus we have historically had a fundamental imbalance as between the two basic types, as well as between the total research needs of agriculture as a whole and the amount of work actually done.

A recent report of the National Science Foundation shows growth in private industrial research and development from approximately $2 billion in 1951 to $3.7 billion in 1953, which, added to industrial research and development work done by public agencies, educational institutions and foundations, amounted to about $5 billion in 1953.

It is notable that only about 4 percent of the $1.7 billion spent on research and development by industry, $150 million was spent on basic research. The remainder was spent on applied or utilization research and plant and process development.

It is also notable that of the 15,000 industrial concerns doing research and development work, 1.5 percent or 375 of the large ones employing 5,000 workers or more, did 70 percent of the research and development work. Eighty-five percent of the expenditures were accounted for by 9 percent of the companies hiring 1,000 or more employees. Trade and industrial associations did very little direct industrial research and development work, comparatively speaking.

This points up the main problem in industrial development in the utilization of agricultural products. Agriculture is an industry of small units and most of the farmers' business associations, which do some research to be sure, are not large enough to finance and organize extensive programs in industrial research and utilization. Such research as is devoted to improving processes and initiating new products is largely done in collaboration with the Department of Agriculture and land-grant colleges.

It is true that private industry which utilizes agricultural products conducts some utilization research and development to further its own lines of business. Agricultural products at present are largely regarded as raw materials in the food and textile industries, and these 2 industries spent about 1.5 and 0.8 percent respectively of the total industrial expenditures in research and development; whereas chemicals spent 9.8 percent, petroleum 3.8 percent, machinery 8.6 per-

cent, electrical equipment 21 percent, aircraft 20 percent, and miscellaneous industries 16.3 percent. The following table is from the National Science Foundation preliminary report on Science and Engineering in American Industry:

TABLE 1.—*Research and development cost and number of companies conducting research and development, by industry, 1953*

Industry	Research and development cost		Companies conducting research and development	
	Amount	Percent distribution	Number	Percent
	Millions			
All industries [1]	$3,699.4	100.0	15,560	100.0
Food and kindred products	54.2	1.5	860	5.5
Textile mill products and apparel	28.0	.8	690	4.4
Paper and allied products	27.9	.8	450	2.9
Chemicals and allied products	361.1	9.8	1,640	10.5
Petroleum products and extraction [2]	145.9	3.9	260	1.7
Rubber products	53.6	1.4	170	1.1
Stone, clay, and glass products	38.0	1.0	400	2.6
Primary metal industries	59.8	1.6	410	2.7
Fabricated metal products and ordnance	103.3	2.8	1,740	11.2
Machinery	318.9	8.6	3,200	20.6
Electrical equipment	778.3	21.0	1,140	7.3
Aircraft and parts	758.0	20.5	160	1.0
Professional and scientific instruments	171.7	4.6	500	3.2
Other manufacturing industries [3]	604.1	16.3	2,240	14.4
Construction	29.3	.8	100	.6
Telecommunications and radio broadcasting	113.0	3.1	110	.7
Transportation and other public utilities	20.4	.6	190	1.2
Other nonmanufacturing industries	33.9	.9	1,300	8.4

[1] Totals and percents are calculated on the basis of all significant digits and therefore may not correspond exactly with those indicated by the rounded figures shown.

[2] Includes a few companies with relatively small research programs engaged primarily in manufacturing coal products.

[3] Includes the motor-vehicle industry, for which the available data did not permit computation of separate estimates, and also tobacco manufacturers, lumber and wood products, furniture and fixtures, printing and publishing, transportation equipment other than aircraft and motor vehicles, and miscellaneous manufacturing industries.

It is realized generally that the American market for food, feed, and textiles is fairly well satisfied from a quantity standpoint, except for the highly competitive field for new combinations, new processes, and new styles, the realization of which does not contribute generally to increased use of agricultural products as much as to substitution. Most of the industrial research development for agricultural products has been in this field.

If we are to get a broader use of agricultural raw materials in industry, it will require a sponsorship of utilization research and development which is not yet in sight, and it will not be carried on to any satisfactory extent by industries which do not have a direct interest in the production of the raw material.

What agriculture needs is a well-financed, thoroughly organized and aggressively directed program of industiral research and subsequent development aimed at finding economic and technically justified uses for agricultural products in all phases of industry. There should be explored in minute detail its potential and competitive uses for fuel, building material, paper and packaging, chemicals, pharmaceuticals, alcohol, rubber and solvents, oils and paints, insecticides and fungicides, fertilizers, furniture, plastics and cellulose products, lubricants and abrasives, leather and hair products, and wool and wool grease, as well as new forms of food, feed, and textile products. A main feature of this development will be the bringing along of the process through the pilot plant, engineering and development stages, testing the economics and getting the process ready for investment and promotion on a practical basis.

We therefore endorse the principles and purposes of S. 3503. We are concerned that the agency and service contemplated be concentrated on utilization research and development as a net additional attack on the agricultural problem rather than as a substitute for the valuable basic and fundamental research now being carried on in the Department of Agriculture and land-grant colleges; with sepa-

rate appropriations; required to be staffed with administrators and directors experienced in industrial research and development, and yet integrated with the basic research of the Department and land-grant colleges so that where the latter leaves off the new activity begins.

Because of limitations of facilities and personnel immediately available, and in order to take maximum advantage of plant, equipment, and people in private industry, the greatest possible reliance should be placed on research and development contracts with private industry, land-grant colleges, and perhaps even with other appropriate agencies of government.

Inasmuch as the basic purpose of the proposed legislation is in the area of better and more extensive use of our food and natural fibers, it would seem logical to approach the problem from more than one direction. We would therefore suggest that attention be given to the possibilities of extending the program to the field of nutrition research, which has been sadly neglected in many respects. An additional approach might well be in the study of the inherent advantages of natural fibers and methods of improving them, developing others, and matching those advantages to both present uses and prospective uses which might be developed.

STATEMENT FILED BY A. LEE TOWSON, JR., SEABROOK FARMS CO., BRIDGETON, N. J.

May I take this opportunity to thank you for the privilege of appearing before you today in regard to bill No. S. 3503. We at Seabrook Farms are vitally interested in the prosperity of agriculture and the well-being of those who seek their livelihood in this segment of our economy.

Many farmers and processors in our area have changed their methods of marketing from fresh to canned to frozen in the last 35 years. The market for frozen food . as developed by painstaking and costly research. Many engineering and production services took over while laboratory research continues. In our production area growers still produce for the fresh- and canned-food market as well as the relatively new frozen-food market. New markets for historically grown crops and new crops for many of our area of production have resulted from this program. The overall benefit to agriculture in our area has been to provide a more diversified market for its production. The old warning of "don't put too many eggs in one basket" is very true today. Thanks to new markets for old crops and new crops for old and new production areas we find "more eggs in more baskets."

The agricultural problem which we have in our area results from agricultural problems outside our area of production. Speaking in only the simplest terms and broadest sense, the Nation's agricultural problem 25 years ago was largely caused by lack of consumer buying power. The agricultural production for our market was beyond the ability of our markets to buy and not beyond the ability of the market to consume.

Our agricultural problem today is not caused by lack of market buying power, but largely by inability of these markets to consume our tremendous agricultural production in the form of food and fiber as now marketed. Actually, research and mechanization coupled with our natural resources have made possible our great agricultural production. Agricultural research as it is now largely carried on is for better varieties, larger and more efficient methods of production and marketing. The consuming public, even with the greatest buying power ever known is not able to absorb our agricultural production as now marketed.

Our present program to relieve this situation is to idle some of our production potential and wholly give or market at reduced costs a percentage of our present or stored production to countries in the world who have consuming ability, but not the buying power. This present agricultural program is for merely relieving our agricultural problem—not solving it. In fact, with agricultural buying power at such a low point, other problems will be and are being created in our Nation's economy. Agriculture does not want a dole. Agricultural buying power depends on earning power. Idle acres are a liability just as are idle factories. Therefore, we have idle earning power and less buying power. Overhead in all its phases as taxes, insurance, depreciation, living costs, etc. goes on for the agricultural family and farm enterprise as it does industrial worker and industrial enterprise.

Bill No. S. 3503 recognizes that our research in agricultural needs to be broadened: We need new crops, new markets and uses for old crops. We need

more diversification in agricultural research, production, and uses of agricultural products.

Soybeans are an example of what can be done. We not only export them, but we have a great industrial market. Agriculture must be able to produce more for our industrial market. This market will produce earning power and finally buying power. Agriculture needs the earning power which the industrial market can create.

Agriculture in America knows how to produce through research and extension. Mechanization along with extensive use of chemicals and genetics has brought about production potential. All this is a result of research which has been and still is chiefly concerned with the production of food and fiber.

It takes courage and foresight to make success. No industry or business has been successful that did not have men leading them who had these characteristics. Agricultural leaders have these characteristics, but they need the tools and markets of industry. The purpose of this bill is to extend the opportunity for agriculture into the broader field of industry. Such an achievement will provide for agriculture opportunities similar to that of industry. Furthermore, our agriculture would then render a still greater service to our Nation's economy.

STATEMENT FILED BY GEORGE L. MCNEW, MANAGING DIRECTOR, BOYCE THOMPSON INSTITUTE FOR PLANT RESEARCH, INC., YONKERS, N. Y.

It is easy to lose our sense of perspective when worrying over the problems of farm surpluses. The agricultural establishment has an excess capacity of only 4 or 5 percent. Unfortunately, we have compounded the evils attendant to this condition by our policies of the past decade so substantial surpluses dominate our thinking. Our steel industry welcomes a much larger surplus capacity. The only difference is that steel can manage it surplus while the farm economy has become a slave to its condition.

A storehouse of 600 million bushels of wheat seems tremendous when one considers its effect on prices but it would be a godsend in case of war. Even in peacetime, it is not tremendous when one recalls that black stem rust could destroy this amount in 3 years if an infestation equivalanet to that of 1936 was to recur. These 600 million bushels are insurance against catastrophe if we know how to manage them. They create a catastrophic condition only when they are permitted to hang as a threat over stable markets.

Furthermore, we should remember that the United States of America is fortunate to have a highly productive, efficient farm establishment. It provides the basic strength that makes this country great. From the skill of our farmers and the fertility of the acres under their management there pours forth a wealth of productivity that has carried the Nation and its allies through two tremendous wars with minor impairment of health and well-being.

The great agricultural productivity has released hundreds of thousands of farm youth to the ranks of industry, commerce and science. At the time of the Revolutionary War it took 9 farmers to support 1 worker in industry, while today 1 farmer supports 14 other workmen. The great industrial wealth of America has been created by the brains and hands that were made available by an efficient agricultural economy. Well-fed, well-clothed, well-housed people could divert their energies into creating new knowledge and using it to achieve a standard of living such as the world had never before seen.

In the background of our thinking we must remember that within two decades, when our population should exceed 200 millions, we will need extra productivty equivalent to 160 million acres at current standards of farm efficiency. These acres are not to be available beyond 15 million to be released from use in supporting animal power and a like amount that may be reclaimed by drainage and irrigation. One arrives at the conclusion that the surplus productivity of today is only a guaranty of our future strength. This we must not forget. We must not impair the productivity of agriculture. It is to our national interest to keep it fully productive and to continue all the research now in progress on better cropping and livestock management practices.

Certainly this long-range view will not be promoted by permitting economic corrosion of the farm economy today. Aside from the social injustice of exploiting a segment of our population in a time of national prosperity, it simply is not good business to permit our farms to be weakened. The farmers must not be

forced to permit land to erode and lose fertility, insects and diseases to become widespread, and equipment to deteriorate. Strong, productive farms are national assets that must be preserved for the good of all of our people.

CHOOSING THE COURSE FOR A STRONG FARM ECONOMY

There appear to be only five possible courses of action. In increasing order of merit these would appear to be as follows:

(1) Sit tight and wait for population increases to take up the slack in consumption. This would assume a stable rate of production for the next 10 years. Even if research on production was discontinued this is not likely to occur. No one could seriously commend this program because it would be too slow to prevent a general economic collapse and it would weaken us two decades hence when we will need greater productivity on our farms than today.

(2) Place our farms under Federal regulation. No one but a Socialist would recommend such a course of action and no one but a fool would attempt to implement it. We have been nibbling at such an idea in our parity support-crop quota system long enough to judge it objectively. The procedure is not relished by the farmer, the taxpayer, or the consumer. It is not politically expedient to tax the people to create artificial scarcity so as to increase the cost of living. What we need on our farms is a state of full productivity so costs of raising crops and livestock will be kept to a minimum. Only this course should be followed in providing our people with inexpensive food. This is the course that gives the American farmer a flexible business where he can exercise his full ingenuity and independence.

(3) Attempt to repeal the law of supply and demand in a free economy by providing Federal subsidies on overproduced crops and commodities. We have had enough experience in the past two decades to prove the folly of this pathway. It leads to uneconomic productivity, artificial barriers, and corrosion of the inherent independence of farmers. The end result is to lower the morale and initiative of a vital segment of the American economy and to create indecision in the market place by placing the fate of the entire agricultural economy in the hands of a few governmental administrators who could create chaos if ill-advised.

(4) Withdraw our least productive lands from cultivation. This has great merit because there are many acres being inefficiently managed or so nonproductive that their retirement to a soil-building program would be wise. The difficulty lies in trying to decide which acres should be retired. In a free economy, a wise government does not have the power to destroy one man's way of life so another may prosper or to dictate where each individual may live. We already know that merely retiring land from a given crop without future control of that land will not work. For example, the 30 million acres usually devoted to overproduced cereals were removed by the existing quota system. About 17 million of that was diverted into feedstuffs for livestock with an attendant overproduction of meat so the problems of corn, wheat, etc., were merely transferred to the livestock industry.

(5) Find a use for the surpluses so the normal forces of competitive bidding will improve the farmer's economic standing and preserve his independence of action the same as any other businessman. Because this course of action seems to be the most logical and in the best traditions of the American way of life, I endorse the Capehart bill (S. 3503, 84th Cong.) in principle with only minor reservations as to details as hereinafter discussed.

When one discusses the use of research as a solution to the problem, he must clearly define the type of research involved. In this particular case the research will have to be primarily directed at the chemical conversion of crop products into industrial uses. Livestock products are much less attractive because they are more expensive as a general rule. Furthermore, an aggressive meat industry has been seeking every possible byproduct use.

There is very little need to look for increased food uses because the American people are consuming pretty near to capacity. Some materials might be upgraded to higher types of commodities so as to stimulate their consumption as food but this avenue of exploitation has been fairly well studied.

What is desired is to find uses that would function as a market stabilizing agent much as the starch industry did for the potato market prior to the recent period of artificial prices and controls. Whenever there was a surplus of potatoes they were processed into starch. However, the starch industry could not

compete with culinary uses so it became a buffer to be called upon when the market reached a distressed state.

There is plenty of room for expansion of industrial, nonfood, nonfeed uses. Currently industry is using less than 1 percent of the wheat and vegetables, 1 to 5 percent of the potatoes, fruits, corn, soybeans, and sugarcane, and less than 10 percent of the cattle products. About 60 percent of the cotton and tobacco finds its way into commercial products.

The difficulty in expanding the industrial uses is one of simple economy. The farm products become chemical reagents and must compete on the open market with synthetic materials produced by chemists in a reactor. The farmer has only the advantage that he is exploiting the sun as an energy source. In order to do it he must carry on an extensive, inefficient business and his chemicals must be recovered and purified by tedious processes. Chemical industry on the other hand is relatively efficient as a general rule because they have close control over the reactions.

There are some types of reactions which a farmer can exploit to better advantage than a chemist. For example, the natives of Kenya, South Africa, pick about 200 pounds of pyrethrum flowers to produce a pound of pyrethrins for use in fly sprays. In order to duplicate this feat the chemist has to conduct 14 reactions and use about 200 pounds of reagents of which 199 pounds are discarded. In such a circumstance chemistry cannot compete with the daisy-like plant. Likewise the chemist finds it more economical to isolate methylene dioxyphenyl groups as saffrole from sassafras roots rather than attempt its synthesis for making synergists for insecticides.

There are probably many such specialized groupings in plants that can be exploited on the chemical market. The difficulty in planning a program is that so little is known about the chemicals in various plant organs. The first need is to analyze plants most thoroughly. Never was the time more opportune for such an effort on a massive scale than today. In the past two decades the physicists and physical chemists have given the biologists and biochemists some ofthe most effective analytical tools ever conceived. One man can do as much in a week today as half a dozen could have done in months before these new methods in chromatography, centrifugation, electrophoresis, polarography, etc., were developed.

THE BASIS OF ORGANIZING A RESEARCH EFFORT

This research must be conceived on a wide basis of operations. It is not to the best interests of research progress to define the scope of activity to restricted objectives. For example, it is not likely that progress will be either rapid or so significant if men are hired to find uses for corn, peanuts, soybeans, or cotton.

They should be hired to study the basic chemistry of plants. One scientist, for example, may be given a laboratory to study aliphatic carbon chains or lipids. His job is to learn all that there is to be known about the subject: their prevalence in different plants, their chemical and physical properties, the places where such things are being used by industry, potential new uses or processes that could be developed. He must become an expert in this sort of chemistry. He should not be concerned in his initial reasoning with whether the material is to come from corn, cotton, or weeds. When he gets to the advanced stages of research he then studies the economy of production by various plants and the acreages available.

This basic research approach may sound like the long way round but, please believe me, it is the only sensible one. We are looking for new types of chemicals that can compete in the open market place. This is the way to find them. If, instead, we tell the scientist to go forth and find a use for corn, for example, he may spend the rest of his life trying to drive square pegs in round holes. It simply won't work unless accidental discovery is kind to him.

Obviously, there is some hazard to giving scientists great latitude for exploration. They may become hopelessly enmeshed in a morass of trivialities or get into nonproductive studies. The safeguard against this fate must rest in the hands of a competent administrator who will be capable of evaluating technical progress and its economic significance. When a line of endeavor has revealed little of promise, the scientists will have to be transferred to research on another class of chemicals.

What sort of chemical groups should the studies be directed toward? There is no need to catalog them but a few examples might be cited of things that

might find use in the pesticide field. The heterocyclic sulfur compounds are fungicides so natural heterocycles should be isolated, tested, and reacted with other substituents. The plant-growth regulants such as indole compounds and the insecticides such as nicotine focuses attention on the heterocyclic nitrogen compounds of plants. There are probably lipoid-soluble groupings in plants that could be used to advantage to increase the potency of pesticides and render them safer for use on crops and livestock. There are phenolic and quinone compounds potentially useful in pharmacology. The aid of microorganisms might be exploited in breaking plant commodities down into unusual but useful chemicals. Illustrative are the antibiotics and feed supplements from industrial fermentations. The list could be compounded many fold.

The goal of this program is to reduce surpluses. The search for industrial uses is only one facet of the program. It would be just as realistic for us to seek other crops that would compete with existing crops for acreage but would find other outlets in consumption. It is entirely conceivable that some concentrated research should be done on weeds. Although research in this area has never been very profitable it is well to remember that a weed is only a plant for which man has not yet found a use. Some of them have excellent growth characteristics and could be exploited.

The harsh fact remains that man with 3,000 species of plants around him gets 80 percent of his food supply from 12 species. He has done very little better in finding other uses for the remainder. New crops can be used to advantage as witnessed by the growing acreage of sesame in the United States. One of the valuable ingredients from this crop is sesamolin, a chemical that increases the effectiveness of insecticides by synergistic activity.

The main thing to remember is that scientists are hired for their ingenuity and specialized training. The job in organizing research is to provide maximum opportunity for exercising both abilities. This calls for an aggressive search for useful principles of biology. Give the average scientist a good set of sound principles and he will be able to find useful products and processes. The application of research follows in the footsteps of basic knowledge so the major concern is to organize so new knowledge will be generated.

POSSIBLE ORGANIZATION OF RESEARCH PROGRAM

The proposal in S. 3503 specifies a budget of $100 million per annum. According to the best estimates available from research organizations in industry, land-grant colleges, and private research institutions a budget of this dimension would call for:

(1) A capital outlay of approximately half a billion dollars (400 to 500 million) for physical plant, furniture, and scientific equipment.

(2) Employment of a staff of senior scientists of about 3,500 members with training of Ph. D. or its equivalent.

(3) Procurement of about 5,000 technical aids with B. S. or M. S. degrees.

(4) Assembling a staff of about 6,000 subprofessional people for service and maintenance of facilities.

The question immediately arises as to where the Administrator is to find 8,500 technically trained people with the particular skills required. They simply are not available regardless of whether the research is organized as a separate new institute, by expansion of the four regional laboratories, or by placing contracts in existing institutions outside United States Department of Agriculture.

This situation is not likely to correct itself in the immediate foreseeable future. There is no evidence of an increase in the enrollment of biochemists and biologists in the various graduate colleges to offset present deficiencies, much less provide for this tremendous expansion. Industry has plans for continued growth in research so its demands for chemists are not likely to decrease in the next 5 years. The colleges and universities are facing a swelling enrollment that will double their demands by 1965 so they will need 25 to 50 percent more professors in the next 10 years if they are to educate American youth adequately.

There is no need to lay plans to raid the existing institutions and disrupt their programs. Provision is made in section 5 (a) for transfer of personnel in the United States Department of Agriculture by the President but most of the scientists are so highly specialized or else are doing such important research that there will be little gain from this source—possibly 2 or 3 score at the outside. A raid on the State experiment stations and land-grant colleges for their pro-

fessors would be most shortsighted. Certainly it would be contrary to national interests to remove them from their educational posts at this critical stage in higher education.

This proposal (S. 3503) places us in the exact middle of long-range technological planning for the United States. If we want this program it must be so designed that it will generate a fair share of its own scientists. This simply means that we must not create a new research institute because such places consume scientific manpower without generating replacements.

The best scheme at this time is to reduce the program to a workable level, such as $20 million of expenditure per annum. This money should then be placed out on a contract basis with institutions which are capable of handling it effectively. The contracts would provide for four items: (*a*) equipment and expendable supplies required for prosecution of the research; (*b*) funds for creating fellowships of $2,400 to $4,000 per annum so the best scholars (top 10 percent of intellects) in the graduating classes would be attracted into scientific pursuits instead of being squandered in sales or production duties of industry; (*c*) supplementary payments could be made to outstanding scientists by their own institutions so scientific positions would be more attractive to both the professor and prospective students; and (*d*) reasonable allowance for administrative overhead and use of physical facilities.

This program goes to the heart of this scientist shortage problem. The reason there is a shortage is because bricklayers and truckdrivers get more than a starting young Ph. D. scientist who has invested 8 years of his life in academic pursuits, invested about $20,000 in education and foregone about $35,000 of potential earnings. The boys who want to be scientists should not be expected to make such sacrifices. They must be paid generously as graduate students and see something better ahead of them after graduation.

We propose, therefore, the creation of an administrative unit, presumably in the United States Department of Agriculture so its activities would be coordinated with those research efforts now in progress but would not be dominated by present policies, to provide grants for contract research. Contracts should be let on a long-range basis but not in perpetuity as a right of any institution or political subdivision. Contracts would be renewed as long as they were productive but the Administrator would be free to remove them to more favorable climate at his discretion.

Contracts should be awarded to institutions where special skills exist. For reasons explained above, the land-grant colleges would have a priority but this certainly would not rule out the liberal art universities where strong chemistry is to be found. It is conceivable that a modest proportion of the funds could be placed to advantage in the four regional laboratories of the United States Department of Agriculture, in regular ARS branches of the United States Department of Agriculture at Beltsville or elsewhere. Some aspects of the research should be placed with private research institutes or industrial concerns.

Scientists should be given great freedom in searching for new ideas and reducing them to practical use. They will undoubtedly need pilot plant equipment for demonstrating the feasibility of these ideas.

However, it should be remembered that chemical engineering is a highly developed science. There are many industries in this country with tremendous technological know-how in chemurgic processes and in efficient design of chemical reactors. When this stage of development is reached the aid of industrial researchers should be sought, first as consultants and then as major investigators in their own organizations.

It would not be to the best interests of our economy to permit unlimited manufacture or erection of factories by the agency as implied in section 5 (b). Erection and operation of a factory should be exclusively on a demonstration basis after industry had been advised of the new process and had failed to respond to invitation to put it into operation. Where demonstration factories are found necessary, a time limit on their operation by Government agencies should be specified.

The central staff of the Administrator would be relatively small with several capable scientists as assistant administrators to appraise research progress, and serve as a programing committee, a project or contract division, a statistical and report division.

Research has certain limitations that should be emphasized before a bill of this sort is voted into existence. No one can turn a crank in a scientific laboratory and grind out new products and processes infallibly and according to the

demands of the moment. Beforehand, knowledge has to be acquired and useful principals must be formulated. It is only then that research leaves the realm of chance discovery and enters into the realm of scientific order. Scientists are human beings with inquisitive brains and a reservoir of knowledge to guide their imagination. They are neither gods nor miracle men that can achieve wonders.

These ideas have been expressed neatly by Crawford H. Greenwalt, president of E. I. du Pont de Nemours Co. In discussing research effort during the past war he said: "Research is no more than the application of creative thought to human problems and we must understand full well that creative thought cannot be hurried—whatever the pressure, whatever the incentive. Research takes time to mature, to develop. While the process can be speeded somewhat by additional talent, by more equipment, by more dollars, there comes very soon the point of diminishing returns beyond which further expenditure is merely wasteful * * *. In research, as in no other area of industry, we are dependent upon what we know and what we can do at the time the emergency arises. Certain miracles can be performed but rarely overnight."

The agricultural surplus problem will not be solved overnight by research even if 100 million—or a billion—dollars is appropriated. Unfortunately, this Nation has been so preoccupied with increasing productivity and solving other practical problems that we have not been diligent in filling up the reservoir of basic knowledge. This must be done even as we struggle to meet an emergency. Although this research may be more than a decade late in its conception, certainly there is nothing to be gained by further delay. We should push forward as fast as manpower and existing knowledge will permit.

ABSTRACT

(1) The material strength of the United States has its roots in the strongest, most efficient agricultural establishment in the world. The capacity to produce 4 or 5 percent more than is required is a blessing that should never be feared. The surplus is a problem only because it affects prices.

(2) It is our duty to keep agriculture just as strong, efficient, and productive as possible because it is our insurance against unusual circumstances today and want in the future as the population grows.

(3) The farm surplus problem must be solved so as not to impair the productivity of the farms or the independence and initiative of farmers.

(4) Of the various options for managing surplus production the most promising would seem to be to increase the diversity of agricultural markets. This can be done either by finding new industrial uses of existing crops or by developing new nonfood crops that would compete for existing acreage. Research should be launched in both directions as rapidly as possible.

(5) Two practical problems are involved in initiating crop utilization research at this time: A shortage of trained personnel and a deficiency of basic knowledge on plant chemistry. Because of this it is suggested that the program be initiated with an annual budget of no more than $20 million and much of the funds be placed by contract in those research institutions where specialized abilities in chemistry already exist and where exceptional young scholars could be attracted to serve as apprentices.

(6) The organization of a separate research institute or a substantial expansion of existing branches of the Agricultural Research Service of the USDA would not be indicated because they consume scientific manpower and do not generate replacements. It would be contrary to the best interests of this Nation to have these agencies raid the land-grant colleges and universities for scientists at this time when the higher educational institutions are facing an impending crisis in developing competent staffs to educate a large new generation of scientists.

(7) The entire research effort must be designed so as to develop a full understanding of the chemical constituents of plants and to provide useful new principles in biology. It is suggested that research should be organized according to the various types of chemical groups in plants with particular attention to those types that are likely to be useful in highly specialized applications that would earn premium prices.

(8) We doubt the wisdom of wording the act so scientists would be restricted to working on uses of a specific crop. The scientist is more likely to find a lasting solution by looking for special chemicals that can be found in plants

and then choosing the particular plant that could produce it efficiently. The cotton surplus, for example, may be solved by growing sweetpotatoes, peanuts, or even useful weeds on some of the cotton acreage until the price of cotton reasserts itself in a free economy.

(9) There would seem to be no sound reason for establishing Government agencies in the manufacturing business. Processing crops beyond the dimensions of a pilot plant would be unnecessary except on a demonstrational basis and should be so defined in the act.

Senator CLEMENTS. The committee is in recess until 2 o'clock.

(Whereupon, at 11:48 a. m., the committee recessed until 2 p. m. of the same day.)

AFTERNOON SESSION

Senator CLEMENTS. The committee will come to order.

I would like for the record to show that the statement of Mr. Homer L. Brinkley, executive vice president of the National Council of Farmer Cooperatives, has been filed for the record, and also that of Mr. John C. Lynn, legislative director of the American Farm Bureau Federation; Mr. Lee Towson, Seabrook Farms, Inc., Bridgeton, N. J.; and Mr. George L. McNew, managing director, Boyce Thompson Institute of Plant Research, Yonkers, N. Y.

Dr. Maclay, the committee will be glad to hear you at this time, sir.

STATEMENT OF DR. W. D. MACLAY, CHIEF, NORTHERN UTILIZATION RESEARCH BRANCH, AGRICULTURAL RESEARCH SERVICES, UNITED STATES DEPARTMENT OF AGRICULTURE

Dr. MACLAY. Mr. Chairman, members of the committee, the major research effort of the Northern Branch is directed toward the utilization of cereal grains and oilseeds. I appreciate the opportunity to describe some of our current results and the very considerable opportunities which we now have for making signal gains in the development of larger outlets for wheat, corn, soybeans, and flaxseed through an intensified research program.

FERMENTATION OF GRAIN INTO HIGH-QUALITY MICROBIAL PROTEIN

Swine and poultry in the United States annually consume about 75 million tons of feed. Cereal grains are the basis for this feed and, generally, compose 50 percent or more of the ration. However, the proteins of cereal grains are deficient in certain essential amino acids necessary for best reproduction and for rapid and economic growth of young animals. Large amounts of lysine and methionine, in particular, are lacking.

The National Research Council has compiled estimates on the requirements for amino acids by swine and poultry. For example, the requirement of the present yearly population of these animals amounts to 175,000 tons of lysine, in addition to the amount found in existing rations. The use of protein feed supplements rich in such critical amino acids would lead to more economical production of swine and poultry. Lower costs would stimulate increased consumption which, in turn, would lead to increased utilization of grain for feeds.

We believe the most economical and practical method of getting the needed protein quality is to ferment grain by micro-organisms which will yield a protein containing 20 percent, or more, of the desired amino acid.

In this manner grain would be used to produce the high-quality protein required to supplement grain feeds. In research currently under way, we have found micro-organisms with protein containing up to 12 percent lysine.

We believe that much higher levels of the desired amino acids can be obtained through artificially induced mutations and through studies of the nutritional requirements of the micro-organisms.

The goal of this research is to produce a protein containing 20 percent lysine. If successful the germination of 1 bushel of grain will give enough product to fortify 3 additional bushels of grain up to the recommended level for this amino acid.

On this basis, it would require the germination of about 175 million bushels of grain to produce the lysine to meet the annual needs based on the National Research Council's recommendations.

DIALDEHYDE STARCH—A NEW CHEMICAL

An economical process has been developed at the Northern Branch for converting grain starch into a new chemical raw material, called dialdehyde starch. Depending on the degree of conversion of the starch, a whole series of products are obtained. The dialdehyde starches are radically different in properties from the starting material and from other available commercial chemicals.

Their chemical and physical properties are such that there is high probability that either the products or certain chemicals derived from them will find outlets in the markets represented by 240 million pounds of imported vegetable tannins, a billion pounds of polyalcohols derived largely from petroleum sources, 800 million pounds of plastics, and several other smaller volume outlets which, in the aggregate, have considerable importance.

Additional opportunity exists for extended use of certain of the products as improved coatings and sizing agents in the paper and textile fields, which already consume 900 million pounds of cereal starch annually.

A laboratory method for the production of dialdehyde starches has been developed. Work on a larger scale process is now underway. Limited studies of the utility of the dialdehyde starches have shown their high promise in a number of applications. Early tests show them to act as a rapid and effective vegetable-type tanning agent for leather. They can be converted into a strong, tough plastic.

Chemicals, such as polyalcohols, for use in protective coatings have been made from them in good yield. Full exploitation of their market potential, however, will require research along several routes to determine the wide variety of uses they can serve. Their highly reactive nature makes them of value both as versatile products for use as such, as well as raw materials for conversion into other chemical derivatives.

Senator CLEMENTS. At that point, Doctor, is the plan of your research station to go on with the research you mention here that needs to be done?

Dr. MACLAY. That is correct.

It would need to be done on a really large scale to show the use of these materials and their various applications.

Senator CLEMENTS. I understand, then, that you have neither the facilities nor the manpower through appropriations that you now receive to carry on that enlarged research.

Dr. MACLAY. That is correct.

Senator CAPEHART. Mr. Chairman, might I ask a question there?

Senator CLEMENTS. Senator Capehart.

Senator CAPEHART. Maybe the doctor over there can answer it.

Is that generally true of all four of the laboratories?

Dr. HILBERT. As I indicated this morning, our effort, or the results we get are commensurate with the funds that are put into the work.

Senator CAPEHART. You understand that the legislation we are talking about goes beyond the laboratories.

Dr. HILBERT. Right.

Senator CAPEHART. It goes in pilot plants and field tests, which, of course, require considerable funds.

Dr. HILBERT. That is right.

Senator CAPEHART. But just the laboratory proper, you could use more funds there if you wanted to do a bigger and a faster job; is that correct?

Dr. HILBERT. That is correct.

Senator CLEMENTS. There is nothing in your testimony that would indicate that up to this point. The statement of Dr. Maclay, I think, is the first statement that has justified the statement now, Dr. Hilbert, that you are making. That is the reason that I asked the question.

You may proceed.

Senator CAPEHART. Of course, this business with the Government in these laboratories is just like it is in industry with a manufacturing plant. There is just no limit to the amount of research that one can do. It is an endless thing and a very expensive thing, and the more money you have and the more facilities you have, the more of it you can do, of course.

Senator CLEMENTS. But Dr. Maclay made a very specific statement here on a specific item. They could do certain things that they needed by expanding the research in this particular field.

Senator CAPEHART. May I ask one more question, Mr. Chairman?

Take this particular thing you have been talking about here, which is very, very interesting. Would one or more pilot plants and field tests, making the product into a finished commercial product and testing it, be of value to you at this time?

Dr. MACLAY. Do you want me to answer it?

Dr. HILBERT. Yes.

Dr. MACLAY. I would say on this question we would visualize that, as an example, for its use in the paper industry, we would want some group such as the Paper Institute, which is knowledgeable in the field,

to make a detailed study of its use in a variety of applications in paper and paper products.

The same would be true in developing uses for textiles, for plastics, and possibly for tanning agents, to find not only its uses in these fields but in other possible outlets.

Senator CAPEHART. In other words, you could do this maybe building your own pilot plants, or you might subcontract it with private concerns to do the work for you.

Dr. MACLAY. That is correct.

Senator CLEMENTS. I gather from your statement that as far as dialdehyde starches, there would be opportunities for some of the experiments to go on in any one of many different industrial concerns in this country.

Dr. MACLAY. That is right.

Senator CLEMENTS. You may proceed, Doctor.

Dr. MACLAY. In our opinion, this development is one of the most encouraging for new products thus far made from cereal grains.

STARCH IN PAPER AND PAPER PRODUCTS

A large potential market for cereal starches exists in the expanding paper and paper products industry, which now makes about 30 million tons of products annually. As part of this total, nearly 8 million tons of pulp and finished paper are imported to meet the needs of the domestic pulp and newsprint industries. Indications are that domestic supplies of pulp will become increasingly short of meeting the needs of the paper industry.

A large opportunity exists here for a material which will supplement or extend the supply of pulp. It is our conviction that starch is the one product that can most nearly meet the requirements. This may be accomplished by the development of starches or starch products which have superior strength and adhesion properties. They would be applied in conventional manner as a sizing or coating by chemical combination with the pulp or by incorporation of preformed starch fibers in the pulp.

Research at the northern branch has demonstrated that a chemical fraction of starch called amylose, comprising about one-fourth of cereal starches, forms films comparable in strength to those made by the regeneration of dissolved wood fibers. Chemical derivatives of amylose also have been made in the laboratory and converted to films and fibers having considerable strength and water resistance.

The incorporation of amylose or its derivatives into paper or paper products would be expected, therefore, to contribute desirable tensile strength and other physical properties.

The separation of amylose from ordinary starch has been impractical because of the small amount present. A new approach was made, however, through our cooperative research with corn breeders. As a result, new high-yielding corn hybrids have been developed containing more than twice as much amylose as found in normal cereal starches.

Prospects are excellent that the amylose content of the starch of these new hybrids soon will be increased to the point where we shall have available a starch of great practical value in the paper industry.

Increased use of cereal starches in paper and paper products may also be based on investigations made at the northern branch dealing with the chemical reactions of starch and starch derivatives.

These findings include (1) methods for improving the adhesion and water resistance of ordinary starch and starch products incorporated in pulp products, and (2) chemical reactions which can be used to chemically bind the starch to the pulp.

The research program now planned includes the development of (1) optimum conditions for separation of the high-amylose starch, (2) practical methods for preparation of fibers from the high-amylose and ordinary starches and their derivatives, and (3) methods for incorporation of maximum effective amounts of these starches or their modifications in paper and paper products. The full potential market for cereal starches in the pulp and paper industry will be realized when such technological problems are solved.

Senator CLEMENTS. Doctor, you have devoted a good deal of time in this statement to starch. What all is practical to use for the production of starch?

Dr. MACLAY. Well, primarily today most starch is made from corn, and then we have wheat. There is considerable starch made from sorghums today. I would say those are the three principal sources.

Senator CLEMENTS. Which of the three is the most economical?

Dr. MACLAY. At the present time, corn and sorghums, because corn contains about 70 percent starch; wheat contains about 60 percent; and inasmuch as they are alike, or essentially so, and interchangeable, of course, corn then becomes the more economic source of starch today.

Senator CAPEHART. You say that sorghum grains are more economical in their use than wheat?

Dr. MACLAY. I would say at the present time, yes.

There is one from sorghum that is being produced competitively with corn today.

Senator CAPEHART. The time that you have put into grain sorghums, do you feel that you have as much information on its value as a starch producer as you have on corn?

Dr. MACLAY. We have not conducted much work on sorghum starch. The 1957 budget contains an item for utilization of small grains, and it is our plan now to activate a project on the sorghum starches, and that is the first time, I believe, that a real effort will be made in that direction.

Senator CAPEHART. But on the basis of your preliminary experiments in this field, do you think that sorghum is a real prospect in the field of developing cereal starches?

Dr. MACLAY. I would think so, yes; in certain parts of the country, that is correct.

Senator CAPEHART. Mr. Chairman, may I ask this question?

Senator CLEMENTS. Surely.

Senator CAPEHART. How much in dollars do you have to spend this year for such research, that you had in the 1956, and have in the 1957 budgets?

Dr. HILBERT. It is about $12 million.

Senator CAPEHART. $12 million?

Dr. HILBERT. That is right, for all of our research.

Senator CAPEHART. That is in the laboratories?

Dr. HILBERT. That is right.

Senator CAPEHART. That is, $12 million for working out new uses for farm products?

Dr. HILBERT. That is right.

Senator CLEMENTS. Which year, Doctor, are you referring to?

Dr. HILBERT. I am talking about 1957.

Senator CLEMENTS. I think Senator Capehart's question referred as well to 1956.

Senator CAPEHART. Yes.

Senator CLEMENTS. What was your budget for 1956?

Dr. HILBERT. Our budget for 1956 was $9,568,000.

Senator CAPEHART. This is 1956?

Dr. HILBERT. For 1956.

Senator CAPEHART. For 1957, it will be $12 million?

Dr. HILBERT. That is right; $12,154,000.

Senator CAPEHART. Am I correct, now, that the budget for showing farmers how to grow more and look after diseases and all that sort of thing is a total of about $88 million? In other words, you are spending about $88 million, but only about $12 million of it to find new uses and new markets?

Dr. HILBERT. Yes. We are spending $73 million.

Senator CAPEHART. To grow more and eradicate diseases, et cetera, et cetera?

Dr. HILBERT. That is right.

Senator CAPEHART. And about $12 million for——

Dr. HILBERT. For utilization research.

I would like to submit for the record the following three research tables for the Department.

Senator CAPEHART. To find new uses for farm products?

Dr. HILBERT. Right.

(The tables referred to follow:)

Estimated obligations for research, U. S. Department of Agriculture and the State agricultural experiment stations, fiscal years 1940, 1952, 1956, and 1957

[In thousands]

By agency	1940	1952	1956	1957
USDA agencies:				
Agricultural Research Service:				
Salaries and expenses	$19,226	$31,760	$39,655	$49,972
Foot-and-mouth disease research	----------	----------	1,945	3,500
Research on strategic and critical agricultural materials	----------	551	314	314
Allotment from national school lunch	----------	31	32	32
Total, ARS	19,226	32,342	41,946	53,818
Agricultural Marketing Service	1,265	4,343	7,159	8,184
Forest Service	2,092	6,142	8,237	10,000
Farmer Cooperative Service	260	275	278	380
Foreign Agricultural Service	36	135	185	347
Library	124	241	250	275
Total, USDA research	23,003	43,478	58,055	73,004
State agricultural experiment stations:				
Federal-grant	6,849	12,676	24,754	29,504
Subtotal	29,852	56,154	82,809	102,508
Non-Federal	12,635	56,884	78,000	83,000
Grand total, research	42,487	113,038	160,809	185,508

Estimated obligations for research U. S. Department of Agriculture and the State agricultural experiment stations, fiscal years 1940, 1952, 1956, and 1957

[In thousands]

By category	1940	1952	1956	1957
U. S. Department of Agriculture agencies:				
Production research	$16,060	$27,605	$37,793	$47,968
Utilization research (see breakdown below)	5,374	11,069	12,551	15,880
Marketing research	1,569	4,804	7,711	9,156
Total, U. S. Department of Agriculture research	23,003	43,478	58,055	73,004
Breakdown of utilization research:				
New uses:				
Agricultural Research Service	4,242	8,000	9,568	12,194
Forest Service	664	1,238	1,303	1,680
Total, new uses	4,906	9,238	10,871	13,874
Home economics research	380	1,489	1,549	1,857
Other utilization research	88	342	131	149
Total, utilization research	5,374	11,069	12,551	15,880

Estimated funds and personnel related to research on new uses, U. S. Department of Agriculture and the State agricultural experiment stations, fiscal years 1940, 1952, 1956, and 1957

[Dollars in thousands]

	1940	1952	1956	1957
Funds:				
USDA agencies:				
Agricultural Research Service	$4,242	$8,000	$9,568	$12,194
Forest Service	664	1,238	1,303	1,680
Total, USDA agencies	4,906	9,238	10,871	13,874
State agricultural experiment stations:				
Federal-grant	75	103	194	236
Subtotal	4,981	9,341	11,065	14,110
Non-Federal	138	455	3,120	3,360
Total, new uses	5,119	9,796	14,185	17,470
Personnel:				
USDA agencies:				
Agricultural Research Service	455	1,337	1,400	1,650
Forest Service	177	220	186	240
Total, USDA agencies	632	1,557	1,586	1,890
State agricultural experiment stations	36	46	276	300
Total, new uses	668	1,603	1,862	2,190

Senator CLEMENTS. You may proceed, Doctor.

Dr. MACLAY (continuing):

INDUSTRIAL POLYMERS BY FERMENTATION

We have another field of work involving the production of polymers, a name the chemist uses to describe substances of very high molecular weight. A number of polymers such as gums, sizing agents, films, plastics, and synthetic fibers, are used in many industrial applications.

The total annual domestic production and imports of such polymer materials is estimated to be about 2 billion pounds. Expansion of industrial uses for ordinary cereal starch is dependent largely upon its conversion into materials with a new range of properties.

We now have methods for producing such materials which, in many ways, are more versatile than either the chemical or plant breeding

approaches. They are based on the scientific control of selected micro-organisms to produce the types of materials wanted. Thousands of different kinds of yeasts, molds, and bacteria are known to produce a great diversity of products, including polymers.

This approach has already been used with high success at the Northern Branch in developing the processes used in this country and abroad for producing all, or most, of the penicillin, dextran, and gluconic acid, and much of our vitamins B_2 and B_{12}, widely used in animal feeds.

Our research has gone far enough now to show that micro-organisms produce many materials from grain of industrial value. Included are products such as gums, extremely stable plastic-like materials, sizing agents for synthetic fibers, vitamin A, and related carotenoids, and rubber-like materials.

This research program includes an exhaustive search for the particular strains of micro-organisms that produce the desired products in best yield and the development of processes giving maximum quality and yields. Finally, comes the evaluation of the products for specific new end uses.

On the basis of our experience in fermentations we have every confidence that new efforts in this area will yield results of equal and greater importance to grain utilization than the best of our past accomplishments.

ORGANIC ACIDS BY FERMENTATION

Organic acids represent a class of chemicals many of which can be produced in good yield through the fermentation of grain products. Four such acids—citric, fumaric, itaconic, and gluconic—are being manufactured commercially. Department research has played an important role in these developments. Certain of these acids have been used, to a limited extent, in special rubbers, plastics, industrial finishes, and cleansing agents.

The total amount of the chemicals used in these general fields amounts to around 2.5 billion pounds annually, with a value of about a billion dollars.

As an example of the results of our recent research, one company is using our process to make 3 million pounds per year of an acid derivative for use in washing bottles, milk cans, and in aluminum etching compounds.

The problem for research on these materials is twofold: (1) To develop more economic methods by either increasing yields or by reducing the time required for fermentation; and (2) to find new large uses for the acids and their derivatives as chemicals, raw materials, or finished products.

In the first case, we are finding encouraging economies in the production of both citric and fumaric acids. There is considerable industrial interest in our results. With respect to the development of new outlets for the acids and their derived products, less work has been completed.

However, from the nature of what leads we have thus far, it is believed that both itaconic and fumaric acids will find expanded use in making special types of synthetic rubber and plastics. Prosecution of this type of work according to present plans holds much promise for the increased consumption of cereals, starches, and starch products.

INCREASED CONSUMPTION OF BREAD AND BAKERY PRODUCTS THROUGH QUALITY IMPROVEMENTS

There has been a steady decline in the United States per capita consumption of wheat over the last half century. In the last 15 years alone the decrease has been nearly 20 percent. If each person today ate as much bread as he did 15 years ago, we would consume about 100 million bushels more wheat per year. To do this each person would have to eat bread or other bakery products equivalent to but two more slices of bread per day.

We believe the trend downward can be stopped, or even reversed, by intensive research and development that will put more palatable, convenient, nutritious, and economical baked products in the hands of the consumer.

Consumer preference surveys conducted by the Department have shown that freshness is the quality factor rated highest in determining the acceptability of bread. It is therefore essential that means be found to market bread as nearly in its oven-fresh condition as possible. At our Northern and Western Utilization Research Branches we are actively carrying out several lines of work toward this end.

Experiments on the application of quick-freezing techniques have shown that deterioration of quality can be prevented if the freshly baked product is properly frozen and handled. We believe this can be made into a practical method of processing and distribution.

Studies on the nature of the deteriorations which take place on staling show that the starch in bread undergoes a change in its physical state as the bread ages and becomes stale. Laboratory trials with experimental loaves, formulated to prevent this change in the starch, have shown that bread of greatly improved keeping quality can be made.

Also new and promising leads have been developed in our search for dough improvers which are expected to produce bread of better quality with less tendency to stale. The significant progress made in the separation and identification of constituents responsible for aroma, flavor, and keeping quality is basic to developing means for maintaining these desired qualities.

Completion of the research and translation of the findings mentioned above into practical use will result in significant contribution to our goal—enlarged consumption of bread and bakery products.

NEW INDUSTRIAL PRODUCTS FROM SOYBEAN AND LINSEED OILS

As all of us know, large quantities of soybean and linseed oils are used each year in paints, varnishes, and special industrial coatings. However, in the last 20 years the amount of oil used in a gallon of paint has dropped from 2.4 to 1.4 pounds.

This decline has come about largely through the replacement of vegetable oils by products made from petroleum and coal. Fortunately, this occurred during a period of expanding markets for paints, so the total overall use did show a slight increase. If the composition of our paints were the same as 20 years ago, we would be using half a billion more pounds of vegetable oils.

The present exacting requirements for various qualities in paints, such as durability, color stability, rapid air drying or baking, lack of

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odor, and low fire hazard, can no longer be met just by mixing drying oils, pigments, and driers. The comparatively small amount of research effort on vegetable drying oils has permitted only limited success in meeting the competition from synthetic products derived from petroleum and coal.

The need is for research which has for its object (1) the determination of the chemical factors in the oil responsible for its quality, and (2) the discovery of the chemical reactions through which it can be converted into improved materials for paints.

Senator CLEMENTS. Right at that point, Doctor, would you go a little further and say what you need to carry out that further research?

Dr. MACLAY. I would say that our success has been primarily in the fields where we have been able to put large teams of people. In case of dextran, we put 40 to 50 men for 3 years and solved the problem as a blood plasma expander. And in this case, I would say, as in most of these, if you could put teams of sufficient magnitude to really put the effort on it, our progress would be much faster.

Senator CLEMENTS. To get it down so that it is a little more understandable to me, what do you mean by sufficient teams? Homer Capehart and I are from the farm. That meant 2 horses or 4 horses.

Dr. MACLAY. It depends on the magnitude of the problem.

Senator CLEMENTS. You understand what the magnitude of the problem is, and you understand much better than we do what you hope to accomplish by it and what is possible of accomplishment.

Dr. MACLAY. I would say to try to find industrial uses for oils, we could expand that work maybe severalfold.

Senator CLEMENTS. You are discussing this in terms of paint?

Dr. MACLAY. Yes.

Senator CLEMENTS. And what do you need to broaden the research in the paint field for the use of vegetable oils?

Dr. MACLAY. You mean in terms of manpower, now?

Senator CLEMENTS. Yes.

Dr. MACLAY. I see.

Senator CLEMENTS. What I had reference to is, what do you propose to do, and you said to put teams in the field. Now, I would like to know how many teams. What do you call a team? And I would like to know the extent of the manpower that is involved and then what you expect that manpower to accomplish.

Dr. MACLAY. Let me take this vegetable oil, for example. We now have about 40 people who cover maybe 18 projects.

Senator CLEMENTS. Doctor, all Earle Clements is interested in is information. He is just seeking information.

Dr. MACLAY. Instead of two people—pardon me——

Senator CLEMENTS. You made a statement, and so I thought you were the best person available to me to get this information.

Dr. MACLAY. Instead of, say, 2 people per project, if we could put, say, 10 on each of those projects, our progress would be far quicker.

Senator CLEMENTS. You say, "each of those projects." Now, I was referring to one.

Mr. MACLAY. Well, this is a general field here.

Senator CLEMENTS. That is what I was trying to do, to take just one item here. What would you consider was necessary to broaden your research on that?

Senator CAPEHART. 200, 300, 400?

Dr. MACLAY. No.

Senator CAPEHART. How many men? What are you going to use them for?

Dr. MACLAY. Take the determination of the chemical factors responsible for the characteristics of oils. I would say we could put 50 men on that.

Senator CLEMENTS. What would they do?

Dr. MACLAY. They would spend their time to get right down to what are the components in oil, such as linseed oil, soybean oil, that gives it its quality, both its good qualities——

Senator CLEMENTS. Is that laboratory research?

Dr. MACLAY. Yes, sir. (Continuing:) And what are the poor qualities, for example? Linseed oil lost out primarily because in interior paints it yellows in the absence of light.

Senator CLEMENTS. This is strictly laboratory research you have reference to?

Dr. MACLAY. That is correct.

Senator CLEMENTS. Go right ahead, sir.

Dr. MACLAY. As a result of such research we have made chemically modified oils which bake rapidly to give hard and durable finishes. Because the new products are based on commercially available materials and can be readily prepared in good yields, we believe that continued research to develop the products on a practicable basis would be most profitable. Other reactions leading to new and improved derivatives are being studied in order to develop commercial products as a part of our program to realize for soybean and linseed oils much of this additional market of one-half billion pounds in paints.

In addition to the use of vegetable oils in paints, a major opportunity for substantially increased utilization of linseed and soybean oils lies in the broad field of industrial chemical products. This field comprises such end uses as plastics and softeners for plastics, special lubricants for use at low temperatures, rubberlike materials, and stabilizers for asphalt and other compositions used for roadbuilding. At the present time these end uses represent a market of about 6 billion pounds of chemicals per year, and the demand is expanding rapidly. Because of the tremendous amount of research done on synthetic organic chemicals from petroleum and coal, they have captured most of this market. Current use of soybean and linseed oils in synthetic nondrying oil products is less than 0.2 billion pounds.

Senator CLEMENTS. Let me ask you a question. The item that you would replace by the use of chemicals that have been derived from grain crops in this particular field are chemicals that come from coal; is that right? Coal and oil?

Dr. MACLAY. That is right. We would use vegetable oils to make chemicals, the fatty acid components of them, to use that as industrial chemicals to compete with chemicals now made from petroleum and coal.

Senator CLEMENTS. On the basis of your experiments thus far, which of the two processes produces the superior product? Is the superior product coming from grain or coming from coal and oil?

Dr. MACLAY. That depends upon the chemical made from, say, the oil and the grain, and it would depend on the economics. In some

cases you can produce the same chemical from two sources, but it becomes an economic thing.

Senator CLEMENTS. All right. Are these chemicals byproducts from coal and oil?

Dr. MACLAY. Well, I would not call them byproducts today. The chemicals from, say, the petroleum industry, I would say are pretty major products.

Senator CLEMENTS. Have you been able in your experiments to put those chemicals from grain crops on a comparable basis in cost to those coming from coal and oil?

Dr. MACLAY. In some cases there is about 200 million pounds of soybean oil used for industrial purposes, which I think would be largely competitive with other materials, say, materials from coal and petroleum.

Senator CLEMENTS. Is all that is actually produced up to now in a competitive position with the chemicals that are coming from coal and oil?

Dr. MACLAY. I believe soybeans is; yes, sir.

Senator CLEMENTS. Is not one of the problems that you have in that field the fact that those chemicals produced from coal and oil are produced considerably cheaper?

Dr. MACLAY. That is right. That is a real problem with most agricultural products in the industrial field, to produce them competitively.

Senator CLEMENTS. You have the same competitive situation with coal as coal does with oil in the production of gasoline?

Dr. MACLAY. But, also, you can produce some things from these agricultural products that are not produced from coal or oil.

Senator CLEMENTS. Doctor, I understand that. But I mean, in this particular field, it is, as you said awhile ago, an economic problem.

Dr. MACLAY. That is right.

Senator CLEMENTS. Are the facilities that you have today sufficient to determine whether you are getting the most economic understanding of this production from cereals? I mean, do you have knowledge that would permit you to utilize processes that would make the agricultural items more economical if you had the money to put those plants into operations?

Dr. MACLAY. Well, I believe that by and large those things that we feel have that promise have to go over to such an extent where we can get an economic analysis on them so that we can tell whether or not they can compete.

Senator CLEMENTS. With the funds that you have had up to now, have you had enough experience in your experiments that you believe that there are more economical processes that are available if you had the equipment to experiment with it?

Dr. MACLAY. I do not know that we could say it would be equipment. We surely believe that, if we were able to put increased effort in the various avenues, there is a good chance of finding processes that would produce products which would in turn compete with petroleum products.

Senator CLEMENTS. What prompts me to ask you that question is that certainly we all have had some experience with what was done with reference to coal and shale. The processes were not sufficiently

economical that they could get on a competitive basis with gasoline from petroleum, but they went far enough to convince those who were dealing with it that in case of an emergency they had enough know-how so that sufficient gasoline could be produced from coal and shale.

I thought maybe you had gone far enough to know whether or not pilot plants in this particular field were worth establishing or justified in establishing to get this additional information, as to whether or not you would be in a competitive position with coal and oil in the production of the items you have just mentioned here.

Dr. MACLAY. Those are not on a pilot-plant scale yet. They are in the laboratory, but we feel that they have enough potential or are promising enough at the present time that probably we would want to put them on the pilot plant scale, to find that out.

Senator CLEMENTS. You are not up to that point yet?

Dr. MACLAY. That is correct.

Senator CLEMENTS. All right. You may proceed.

Dr. MACLAY. The figures of 6 billion and 0.2 billion reflect the relative expenditures for research on the use of the mineral and vegetable raw materials.

To expand the use of linseed and soybean oils, it is necessary to discover and develop new derivatives from these oils that can compete with synthetics in quality and price. At the northern branch, we are engaged in a promising line of work devoted to developing new chemical products from soybean oil. New types of derivatives have been discovered that look suitable as new materials for making plastics and softeners and stabilizers for plastics. Limited evaluation of these softeners indicate that they may prove to be superior to many softeners now on the market. Studies are also underway on the further evaluation of these softeners and on their production to determine their utility and cost. We are exploring the production of plastics from these new derivatives. As softeners and stabilizers alone, our new derivatives might be used to the extent of 30 million pounds. Our research also has opened brandnew fields for investigation through the discovery of new reactions of these oils which could lead to their greater use in a variety of synthetics.

Mr. Chairman and members of the committee, I hope that this brief description of several of our more important areas of research has served to illustrate both the objectives and the future possibilities of research directed toward the utilization of cereal grains and oilseeds. May I, again, express my appreciation for the time you have allotted to discuss these matters with you.

Senator CLEMENTS. Doctor, any of these competitive items or any of these items that you would propose to replace by products that come from the use of cereal grains, are any of those items in short supply?

Dr. MACLAY. Yes. I would say in the pulp field, we import pulp, which has large potentials. We have a shortage, a very definite shortage, of nutritional amino acids for proper livestock feed. In the starch field, there is no shortage of starch as such, but starch is having tough competition with synthetics, and there is great potential there of improving the starch products to make them more competitive and find new and greater uses for them.

Senator CLEMENTS. Pulp is the major item in here that you would suggest that you would be replacing that is in an import class?

Dr. MACLAY. That is a big volume type of thing. That is correct.

Senator CLEMENTS. If you replace coal and oil, you are just moving one surplus over for another surplus to accumulate.

I am just seeking information, now. I am not in the coal business, and I am not in the oil business, but I am just merely seeking information.

Dr. MACLAY. Of course——

Dr. HILBERT. Our markets in the United States are expanding all the time. And these markets are being sought by the producers of agricultural products, by the producers of coal, the gas industry, and our ore industry.

Senator CLEMENTS. I understand that.

Dr. HILBERT. So there is continual warfare going on.

Senator CLEMENTS. I understand that any time it is not a competitive situation, it will not be a healthy situation in our country.

Dr. HILBERT. That is correct.

Senator CLEMENTS. And therefore, I would like to get such items as I could where you are actually replacing an item that is in a heavy import position. And we know that is very true of pulp.

Dr. HILBERT. Yes.

Senator CLEMENTS. Are there any questions you would care to ask of Mr. Maclay?

Senator CAPEHART. Yes. I would like to say this, that while that may be true that they may be working on it, and you might well work out under this legislation some new uses for farm products that would compete with presently known materials, I think the thing we have got to keep in mind there is that you have some 5 million farmers who would be doing the job in the United States as compared to a small number of oil companies or a small number of coal companies, and I think you have got the other problem, of course, that some day we may well run out of coal and might well run out of oil, and we ought to know how to do these things.

But I can envision the day when we might well grow over 90 percent of our newsprint. Every newspaper in the land is dependent upon foreign newsprint.

Senator CLEMENTS. That is exactly the reason I asked the question, because, of course, we may run out of oil in your lifetime, but if we run out of oil in your lifetime, it will be because the sealanes will be closed. But nobody knows better than my friend from Indiana that there is no prospect of our running out of coal in this country during your lifetime and mine.

Senator CAPEHART. I think that is correct. But I do think we have a tremendous problem facing us with respect to paper.

Senator CLEMENTS. I think that is correct.

Senator CAPEHART. I think the time will come when we will have to grow our own paper right on the farms, right off the fields.

Senator CLEMENTS. That is why I asked Dr. Maclay the question. It is not that I would want my statement or the questions I asked to be interpreted as a lack of interest in the experiments that you are making a the present time. I think the record ought to be clear that

it is much more important for you to be working on pulp than it is for you to be working on something that is going to replace coal and oil when coal is running out of your ears and when we are spending a young fortune both in private industry and in Government to try to get coal in proper use.

The Senator from Indiana has a coalfield in his area——

Senator CAPEHART. A lot of them.

Senator CLEMENTS. That is in a depressed situation today, and I know of very few coal areas in this United States that are not depressed. And certainly, that is scant reason for any heavy effort being made in research to put agricultural products in competition with something else that is in great surplus if there is a field where there is a great opportunity, and certainly, in the field of pulp, it is one of the real opportunities, I think, for the Department of Agriculture, for private industry, for foundations or any other group in this country to work on ways and means of using farm products for the making of paper.

Senator CAPEHART. Mr. Chairman, we have another problem, and that is, we have testimony here today—I referred to it this morning—where just 1 big corporation is spending $70 million this year to find ways to take the business away from the cotton producers in new rayons. Now, that is what the farmer is up against, of course. It has been true that there has been nobody to do the research for the farmer on that which he grows, and yet, industry has had millions and has spent millions and millions and millions in research in coal, or research in oil or research in synthetics to compete with cotton, or synthetics to compete with almost every known farm product. And the purpose of this legislation, or one of the purposes, of course, is that we put agriculture in the same position that industry is in, namely, to research that which grows and that which might grow in order that it can keep up with this fast growing Nation of ours and this fast research pace. That is the purpose of it.

Senator CLEMENTS. Let me call the next witness, and let me tell you that we will move along with these witnesses. Both the Senator from Indiana and I——

Senator CAPEHART. Will try to keep still.

Senator CLEMENTS. Will quit making speeches in here, and we will get more information here for the committee.

Senator CAPEHART. I think we are on the right track, Mr. Chairman. I again am grateful to you for holding these hearings.

Senator CLEMENTS. Dr. Fisher.

Dr. FISHER. Mr. Chairman and Senator Capehart——

Senator CLEMENTS. Dr. Fisher is the Chief of the Southern Utilization Research Branch. Is that correct?

Dr. FISHER. That is correct.

Senator CLEMENTS. You may proceed, Dr. Fisher.

STATEMENT OF DR. C. H. FISHER, CHIEF, SOUTHERN UTILIZATION RESEARCH BRANCH, AGRICULTURAL RESEARCH SERVICE, UNITED STATES DEPARTMENT OF AGRICULTURE

Dr. FISHER. First, I wish to thank you for the privilege of bringing to your attention some of the more important and promising areas

of research that are being conducted in the Southern Utilization Research Branch to give relief to the cotton surplus problem.

Because of severe competition from synthetic fibers, plastics, glass, paper, and metals, we can expect the cotton problem to become worse, instead of better, if we don't do adequate and effective research to hold and expand existing markets for cotton and to develop new markets.

The volume of research on competing materials, which have only about 40 percent of the monetary value of cotton, is probably more than 8 times that devoted to cotton. This situation has stemmed from the conviction of the industries manufacturing the competitive materials that it is profitable to do research aimed at capturing more of the textile market because of the richness of the price—about $2 billion at the farm level and about 10 to 12 billion dollars at the retail level.

Our program on cotton, which has been developed in close cooperation with technical advisers from industry, trade associations and other organizations, is designed to strengthen the competitive position of cotton through research to enhance the value of cotton in its major markets, improve quality and lower costs, and develop new uses.

Senator CLEMENTS. You suggest this as a joint effort, then?

Dr. FISHER. We work closely with other organizations whenever it seems that it will help the program, and that is rather frequently.

Senator CLEMENTS. I believe you said you worked with the technical advisers from industry, trade associations, and other organizations.

Dr. FISHER. Yes; that is so.

Senator CLEMENTS. Do you get any help from farm groups?

Dr. FISHER. Most of them are trade associations for cottonseed: The National Cottonseed Processors Association; and ACMI, American Cotton Manufacturers Institute; National Cotton Council of America, and other such organizations.

Senator CLEMENTS. You do not have any from the farm groups themselves?

Dr. FISHER. Such as——

Senator CLEMENTS. Shall I take it from that that the farm groups have such confidence in the Department that they figure they are getting proper representation?

Dr. FISHER. I hope that is true.

Senator CLEMENTS. All right, sir; you may proceed.

Dr. FISHER. I would like now to discuss weather-resistant cottons to compete with synthetic fibers, metals, and plastics.

Although cotton still is the principal textile fiber used in making "outdoor" fabrics, this 250,000-bale market—awnings, tarpaulins, tents, field covering, umbrellas, et cetera—has been losing ground to synthetic fibers, metals, and plastics. Susceptibility to degradation by light and micro-organisms constitutes the principal weaknesses of cotton in outdoor fabrics.

Much work has been done by various organizations to find practical methods for retarding or preventing deterioration to retain these important markets for cotton. Definite progress has been made in this type of research in the southern branch. Current work promises to bring even more important advances.

In one approach, cotton has been made unusually resistant to weather degradation by first dyeing it with certain light-stable vat

dyes and then treating the dyed cotton with acetic anhydride, which is a low-cost chemical. The combined treatment yields products that resist degradation caused by both sunlight and rotting. The net result is that the weather resistance—or service life outdoors—is increased two- or three-fold.

Other research at the Southern Branch conducted in cooperation with the National Canvas Goods Manufacturers' Association is directed toward improvement of the performance of cotton canvas by the development of more effective and lighter weight weather- and rot-resistant treatments for awnings, tarpaulins, and tents. This work includes improving the coatings applied to canvas awnings so that the attractiveness and decorative aspects of the awnings—brighter and more stable colors—will be enhanced. Current and expected achievements should result in increased consumer acceptance of these products and increased utilization of cotton.

Now getting around to flame-resistant cottons, we believe that the research now underway in the Southern Branch to develop flame-resistant cotton fabrics will improve the competitive position of cotton. In addition, it is important to have improved flame-resistant textile products because an estimated 1,500 persons die and three times this number are injured annually in the United States from fire associated with burning fabrics.

Because of our improved standard of living, and a growing awareness of the hazards presented by flammable textiles, the consumer is developing more interest in flame-resistant fabrics.

In the future it is likely that the consumer will give increasing consideration to flame resistance—particularly for baby blankets, dresses, and other items having a direct bearing on personal safety—when choosing between cotton and synthetic textile products.

This is suggested by the regulations of most large cities requiring flame-resistant fabrics in public places, and by the Flammable Fabrics Act, which prohibits the movement of highly flammable fabrics in interstate commerce. In achieving flame resistance, the advantages lie distinctly with cotton because it is more amenable to treatment with flame retardants than the manmade fibers—that is, with the exception of viscose rayon.

For this reason, and because flame resistance is important also in foreign markets, research on flame resistance presents an unusually attractive opportunity of strengthening the competitive position of cotton and increasing its consumption both at home and abroad.

In a broad program conducted by the Southern Branch in cooperation with the Quartermaster Corps and other organizations, two effective flame-resistant treatments that provide cottons durable to laundering and dry cleaning have already been invented.

Several textile finishing companies are applying one of these commercially to considerable yardages of cotton fabrics, and the other flame retardant is ready for commercial use. Cotton fabrics treated with a combination of the two retardants pass the most stringent tests.

Although these flame retardants for cotton are excellent, we have already discovered other treatments that, on the basis of limited laboratory work, appear to be even better. We feel confident that further work on flame retardants will not only reduce the death rate and property loss resulting from our present flammable textiles, but

will also increase the attractiveness and consumption of cotton in competition with other fibers.

Next I would like to discuss new chemical fibers from cotton that have special properties needed for specific end uses, including some of those now served by manmade fibers.

Cotton, our most versatile general-purpose fiber, has enjoyed a strong position for many of the older conventional textile uses. As our economy has been made more complicated by technical advances, however, additional end uses requiring special properties have been created. Cotton has been able to compete successfully for some of these end uses, but other fibers—because of certain special properties—serve some of the old and new end uses better.

The factor primarily responsible for the selection of the manmade fibers for some uses is their hydrophobic or water-resistant characteristic. Other properties responsible for the success of the manmade fibers for certain end uses are resistance to heat, acids, and other chemicals and resistance to deterioration caused by weathering and micro-organisms.

While these properties have some importance for wearing apparel and household goods, they are particularly important for textile products going into industrial uses. Because industrial uses still constitute almost one-fourth of cotton's total domestic market—3 million bales in 1946 and 2 million bales in 1953—it is highly important to develop methods for imparting new and special properties to cotton.

This means that we must learn how to tailormake cotton to give it the particular properties needed for specific end uses. Pioneering research at the southern branch has developed several new fibers from cotton having new and special properties. One, called PA cotton, is already in limited commercial production. Having outstanding resistance to deterioration caused by heat and micro-organisms, PA cotton has unusually long service life on commercial laundry presses, household ironing board covers, and in sandbags exposed to damp ground.

Senator CLEMENTS. What does the PA stand for?

Dr. FISHER. It stands for partially acetylated. Cotton is treated with chemicals which partially acetylates it.

In 1952, about 1 million bales of cotton and large quantities of manmade fibers went into uses for which PA cotton could have been used advantageously. Research to effect further improvements in PA cotton might increase the utilization of this cotton product at the expense of the manmade fibers.

Several new chemical fibers from cotton are being investigated in the laboratory and some of them are ready for commercial trial.

Senator CLEMENTS. Are you doing any research along that line at the present time?

Dr. FISHER. We are, and the results look very promising.

Senator CLEMENTS. Might it have any impact on cotton use in the immediate future?

Dr. FISHER. We are hopeful that it will. It is difficult to make any predictions with any great certainty. The competing materials are getting better; their competitive positions are becoming stronger. It is hard to predict the outcome.

Senator CLEMENTS. You mean that you are endeavoring to improve your competitive position, but your competitor is not standing still?

Dr. FISHER. That is right.

Among these new fibers from cotton are those with water-resistant properties, increased soil resistance, increased water solubility, increased or decreased amenability to dyeing, nonstaining characteristics, new elastic properties, and strength even greater than that of the untreated cotton. Potential uses for these fibers include nearly every current application of textile materials. This work on new fibers should not only help to maintain the present level of consumption of 9 million bales of cotton but it also might increase it eventually by 1 or 2 million bales.

WEARING APPAREL AND HOUSEHOLD GOODS FROM COTTON HAVING IMPROVED CRUSH RESISTANCE, DRAPE, AND APPEARANCE

Wearing apparel and household goods comprise cotton's largest current markets, amounting in 1954 to about 3.3 and 2.7 million bales, respectively. Research to make cotton more attractive for these applications and to give it more consumer appeal has already paid big dividends.

The most important advance in this field, which is based on the treatment of cotton with certain resins, stemmed from work done in many laboratories. The success of this development can be illustrated by pointing out that the quantity of cotton (estimated to be about 300,000 bales) treated annually with these resins now exceeds the production of the water-resistant manmade fibers. In addition, resin-treated cotton fabrics are now used successfully to make "minimum-care" or "wash and wear" garments that are competing with somewhat similar "wash and wear" garments manufactured from the manmade fibers.

Senator CLEMENTS. Doctor, to what extent does your laboratory or your research station participate in that development?

Dr. FISHER. I will have to be modest and correct and say that our direct contribution to that was very small. Indirectly, through providing fundamental information about cotton and the chemistry of cotton, I think that it has been appreciable, but our direct contribution has been small.

Senator CLEMENTS. And there is nothing in particular that you would claim, but you were a reservoir for information that the various experimental groups used? You had some basic information that was available to them?

Dr. FISHER. Yes. We have published several hundred papers on cotton science which are available to the industry and research organizations. We think that the information contained in them has been very helpful.

Research now underway in the Southern Branch should lead to even further improvements in the competitive position of cotton in the fields of apparel and household goods. This research includes further study of the use of both new and conventional resins, treatments to improve certain fiber properties of cotton, and investigations to find which types of cotton fiber, yarn, and fabrics are best suited for making attractive textile products of high quality and consumer appeal.

The improved use of resins might bring about several desirable changes, including enhanced crush resistance, soil resistance, dimensional stability, and abrasion resistance; water repellency or absorbency; improved hand, flame resistance; dyeing characteristics; and glazed and embossed surfaces. Only a small beginning has been made toward exploiting the attractive opportunities afforded by this general method.

Another area of research in the Southern Branch aimed at making cotton more attractive for apparel and household goods is concerned with chemical treatments that improve some of cotton's fiber properties such as elongation, toughness, and elasticity.

We have already found that cotton can be treated with certain chemicals that will increase its toughness and improve its amenability to chemical treatments that cause favorable changes in elastic properties.

Because of the important influence of fabric construction (size of yarn, number of yarns per inch in the warp and filling, weave, et cetera) on fabric properties, the Southern Branch is intensifying its efforts in this field.

Through research of this type, it has already developed improved cotton fabrics for rainwear and summer flight suits for several agencies of the Defense Department.

It is expected that future work on fabric construction will further enhance the value of cotton in apparel and household goods. Like the work on resin and chemical treatments described above, the research on fabric construction should improve cotton's position in markets involving several million bales.

STRONGER AND MORE DURABLE INDUSTRIAL FABRICS IMPORTANT

The manmade fibers are giving cotton particularly severe competition in the field of industrial goods. Cotton duck, made from about 500,000 bales of cotton, is encountering increasing competition.

Synthetic fibers are gaining in the manufacture of automobile tops, industrial hose, machinery belts, sails and tarpaulins. To strengthen cotton's position in the field of industrial fabrics, the Southern Branch is conducting research aimed at improving tensile strength, tear strength, abrasion resistance, and other properties that govern serviceability.

Heavy industrial fabrics are being studied to develop yarn and fabric constructions having optimum properties and serviceability. With the commercialization of the loom attachment developed by the Southern Branch, it is now possible to produce cotton fabrics of much higher densities than those previously available.

The dense fabrics made with the loom attachment resist the passage of wind and water, thus obviating the need of using waterproofing materials.

It has been demonstrated that dense fabrics of this type can be used advantageously to protect baseball and other athletic fields. Such a cover, used experimentally during the past 5 seasons at the New Orleans baseball park, has shown no leakage of water and has given good service.

Other possible uses for this type of fabric include hatch covers on boats; tarpaulins for trucks, outside storage and farm equipment; and temporary shelters.

There is a potential market for 5.5 million bales of cotton for products requiring water-resistant properties and 2 million bales for products requiring wind-resistant properties, of which cotton holds only 31 and 50 percent, respectively.

Research on the application of resin and plastic emulsions or latices to cotton fabrics has indicated that this approach affords opportunities for improving properties important in many industrial end uses.

NEW PROCESSING EQUIPMENT TO IMPROVE THE QUALITY AND TO LOWER COST OF COTTON TEXTILE PRODUCTS

Some improvements have been made in textile equipment in recent years, but almost without exception the basic principles of cleaning, carding, spinning, and weaving cotton remain as they were when first originated more than 200 years ago.

The urgent need for improved cleaning equipment has been greatly intensified by the advent of synthetic fibers (which are clean and uniform in quality) and by the large increase in trashy cottons delivered to mills as a result of the transition to mechanized cotton production.

The Southern Branch is developing an "integrated system" for cleaning cotton at the mills, which is expected to be twice as efficient as presently available equipment.

With better cleaning equipment the cotton textile industry can use more advantageously trashy machine-harvested and rough hand-harvested cotton and can reduce the excessive manufacturing waste that is now experienced when mechanically harvested cotton is processed into textiles.

This should greatly aid efforts to mechanize the growing and harvesting of cotton as a means of significantly reducing the cost of cotton.

Current research to improve the uniformity of cotton card silver and reduce the loss of spinnable fiber by a radical change in carding machinery has shown exceptional promise.

If this work proves successful, and there is good reason to believe that it will, this achievement will result in a reduction of 25 to 50 percent in neps (tangled masses of fiber that are imperfections and detract from the value of cotton products) in the card web and a savings in card waste amounting to about $36 million annually, based on the current domestic consumption of 9 million bales.

Research on processing equipment will benefit all cotton textile products by improving quality and lowering costs. This should expand the utilization of cotton and increase the profits to the cotton farmer and processor.

RESEARCH TO ENHANCE VALUE AND UTILIZATION OF COTTONSEED

The growing of cotton fiber in the United States is accompanied by the annual production of 4 to 6 million tons of cottonseed, which has a farm value of more than $350 million and accounts for 12 to 19 percent of the farm value of the entire cotton crop.

It is obvious that having adequate and profitable uses for cottonseed and its products will influence profoundly the economic position of cotton growers.

Cottonseed delivered to oil mills now contains more trash than formerly because of the increased use of mechanical and rough hand-harvesting.

Research at the Southern Branch to develop improved cleaning equipment (called the ARS differentiator) should have several distinctly beneficial effects. It should lead to a reduction in storage costs of $0.25 per ton, or more than $1 million per year.

Linters separated from the seed and worth about $60 million per year are in serious surplus. Use of the ARS differentiator should produce cleaner linters as well as seeds, thereby strengthening linters' position in competing with foam rubber, wood pulp, etc.

It is expected that the differentiator will prove profitable also in obtaining seed of 100 percent viability for planting.

Fats and oils are in surplus and cottonseed oil has been purchased under Government support programs at times to the extent of more than 500 million pounds.

Current research at the Southern Branch promises to benefit the utilization of cottonseed oil by effecting improvements in quality for conventional uses and by providing entirely new uses, such as coatings to prevent moisture loss in food products and as lubricants and plasticizers.

Cottonseed meal, used primarily as a cattle feed, is meeting steadily increasing competition from less expensive sources of nitrogen such as urea.

Research has indicated that the feed value of cottonseed meal can be greatly enhanced, and processes are under investigation to develop improved meals for feeding to chickens and hogs.

This work is expected to result in expanded and more profitable markets for cottonseed meal. The cooperation of the National Cottonseed Products Association, which has had a fellowship program with USDA for almost 30 years, the State experiment stations, and members of the cottonseed industry has greatly aided this program.

It is anticipated that these and related research activities in the Southern Branch will help significantly both the cottonseed and cotton industries.

Mr. Chairman and members of the committee, I again wish to express my gratitude for this opportunity to discuss these subjects with you.

Senator CLEMENTS. Dr. Fisher, we were glad to hear you, sir.

We will next hear from Dr. Sam R. Hoover, Assistant Chief of the Eastern Utilization Research Branch of the Agricultural Research Service.

STATEMENT OF DR. SAM R. HOOVER, ASSISTANT CHIEF, EASTERN UTILIZATION RESEARCH BRANCH, AGRICULTURAL RESEARCH SERVICE, UNITED STATES DEPARTMENT OF AGRICULTURE

Dr. HOOVER. Mr. Chairman and members of the committee, the surplus problem touches almost every phase of agriculture. In our research we are attacking the surplus problems of two of our most important agricultural commodities: dairy products and livestock.

The dairy industry represents a very large segment of American farming in terms of the dollar value of production. The farm value of milk production runs about $5 billion a year.

Livestock production is even greater, totaling about $7 billion each year and accounting for about 30 percent of farm income.

So it is clear that help to these major agricultural industries will help many farm families.

The milk problem has been well publicized. Perhaps less well known is the problem of using up the excess byproducts from livestock production.

Nevertheless, the livestock industry is keenly aware that in its operation, as in those of any other industry, profitable disposal of byproducts can mean the difference between black and red ink on the ledger.

First, let us discuss milk and dairy products.

Milk production has increased markedly in the past few years, and it is still headed upward. This year it is expected to reach 127 billion pounds, the highest ever.

If consumption were not increasing, this could spell trouble. However, last year consumption rose, and it continues to rise this year, so that this year's purchases for price support are expected to be about the same as last year's 5 billion pounds, milk equivalent.

Excellent progress has been made in moving butter, cheese, and dry-milk solids, all of which has been bought under the support program, into retail outlets.

In the early spring the butter inventory was down to zero. In mid-May it was only 15 million pounds. Holdings of dry-milk solids and cheese have been substantially reduced.

Nonetheless, even though the disposal program has been effective, it has been costly. In 1955 the cost to support prices of dairy products and incomes of dairy farmers was over $450 million.

One troublesome aspect of the problem is the case of butter. Butter represents only one-third of the solids present in the whole milk. The other two-thirds, mainly protein and sugar, are in the skim milk. When the cream is separated on the farm, the skim milk is commonly used as a feed, and this is a low-price outlet.

We are convinced that the most effective solution to the milk problem will be one which uses all the milk—in other words, a whole-milk product. The most attractive whole-milk product is a whole-milk powder meeting these three specifications:

1. It must reconstitute to milk of good flavor.
2. It must reconstitute easily.
3. It must have a long shelf life.

Senator CLEMENTS. Before you go any further, I am sure that you would want this record to include the fact that the industry itself did a whale of an advertising job in the last year to take a lot of the surplus milk.

Dr. HOOVER. That is certainly true. The dairy industry did a remarkable job in their commercial advertising.

Senator CLEMENTS. I didn't think you would want this record not to disclose that they did probably the most remarkable job that any of our farm groups have ever done advertisementwise.

Dr. HOOVER. Well, it is anticipating the discussion a little later, but the Leather Industry of America program has had a tremendously successful expansion, also, over the past couple of years.

I think they have done one of the most remarkable promotional jobs in the field of agriculture in our country.

We expect that such a product would increase domestic consumption, especially in areas where fluid milk is not available. It would find increased use by the Armed Forces. It would find an export market. Such a product would relieve the butter surplus and help solve the skim-milk problem.

In recent years a nonfat dry milk with good flavor, which is easy to reconstitute, and having good shelf life has enjoyed a phenomenal expansion in sales for home use. Sales expanded twentyfold in 5 years.

It seems reasonable to expect a similar trend for a good whole-milk powder—when we produce one. We have made good progress toward such a powder.

We have already met specifications 1 and 2. Our powder disperses quickly and easily, even in ice water, to give a milk with good body and excellent flavor—the same flavor as fresh whole milk.

We are not yet satisfied about specification 3; that is, shelf life. Fresh milk has a delicate flavor, and it doesn't take much off-flavor to make milk unpalatable.

To solve the problem of shelf life we need to know which ones of the many components of milk are responsible for the development of off-flavors and for the loss of easy reconstitution.

We need to know how processing affects these components. Getting the answers to these questions is taking us deep into study of the fundamental chemistry of milk, since that is the only way to find the answers. We can find them and we will find them.

Senator CLEMENTS. Has not that been equally true with the efforts to can whole milk?

Dr. HOOVER. Yes.

Senator CLEMENTS. It gives it a little off-flavor. I am talking about the efforts that have been made to can whole milk.

Dr. HOOVER. Yes; there is a definite off-flavor produced in heat sterilization of any milk product by methods so far developed.

Senator CLEMENTS. All that I ever tried had that off-flavor, which was prevalent.

Dr. HOOVER. So far we have made our whole-milk powder one batch at a time. But batch drying will not do for a commercial process. We are experimenting with a continuous high-vacuum belt dryer—the kind used to dry coffee and citrus juices.

It looks promising, but we must carry our engineering studies much further to find the operating features which will turn out the powder in the required physical form.

Senator CLEMENTS. I have to ask you another question at this point.

Do you have the facilities to carry forward that experiment?

Dr. HOOVER. We are working collaboratively with manufacturers of the equipment and have used the equipment in their plant. It is not well adapted to drying milk. It was designed for other products.

We are attempting to develop specifications now for an experimental continuous-belt drier which we hope will do the job with milk.

Senator CLEMENTS. Do you have the money in the agricultural appropriation bill this year to secure that equipment?

Dr. HOOVER. Yes, sir.

Senator CLEMENTS. Go right ahead, sir.

Senator CAPEHART. How much is that appropriation?

Dr. HOOVER. The total?

Senator CAPEHART. For this purpose—I mean this specific purpose. You said you had the money.

Dr. HOOVER. This particular piece of equipment would run—until you get bids in you never knew what something will cost, but in the order of $80,000 to $100,000 for a laboratory size.

Senator CAPEHART. Mr. Chairman, might I ask a couple of questions right there?

Senator CLEMENTS. Yes, sir.

Senator CAPEHART. If you can become successful in powdering whole milk, what is your best estimate how much it would increase the demand or the market for milk?

Dr. HOOVER. My best guesstimate, oh, I would say more than the 5 percent that we have in surplus.

Senator CAPEHART. You mean——

Dr. HOOVER. More than.

Senator CAPEHART. It would take up the surplus and——

Dr. HOOVER. Definitely.

Senator CAPEHART. And then add another 5 percent to it if you could do it?

Dr. HOOVER. Yes. You cannot prove that but that is my guess.

Senator CAPEHART. That would be your guess?

Dr. HOOVER. Yes.

Senator CAPEHART. Of course, this whole program we are talking about would be worth——

Senator CLEMENTS. The potential outlet would be tremendous, would be big.

Dr. HOOVER. I was picking a figure out of the air of 10 billion pounds milk equivalent. That would be 1 billion pounds of product, roughly speaking.

Senator CAPEHART. Would it not be better if you had a good pilot plant to make these experiments in?

Dr. HOOVER. It would be better if we had a better one.

Senator CAPEHART. Wouldn't private industry, if they were going to handle this problem, be thinking in terms of this problem alone of maybe $25 million?

Dr. HOOVER. Over the full development; yes.

Senator CAPEHART. They would be thinking at least in terms of $25 million. If General Motors or Du Pont or somebody had this problem, they were producing milk, they would not hesitate to spend a hundred million dollars to do this job; wouldn't they?

Dr. HOOVER. I couldn't say what they would do.

Senator CAPEHART. What is your best judgment?

Dr. HOOVER. They have put an awful lot of money in private industry into this particular research problem. It has been done by the direct cut-and-try approach and it has not worked. We are working partly by that approach, too, now.

But, as I attempted to say here, we feel that this is a long-range problem, one with a major attack required on it, and there are many problems in the chemistry of milk which have to be solved before the direct attack can be used.

Senator CAPEHART. If you solve this problem it is a tremendous thing for the dairy industry and farming in America and the economy of the Nation.

Dr. HOOVER. We think so; yes, sir.

Senator CAPEHART. It would be worth more than $100 million a year for 10 years if you could solve this one alone. Under this bill if you used all of the money for this and solved the problem, it would possibly be no more than private industry would spend in developing a similar product.

Dr. HOOVER. Yes, sir.

Senator CLEMENTS. I gather from your statement, Doctor, that you think there is greater potential for the dairy industry in the development of a satisfactory whole milk powder than any other single accomplishment than can come to the industry?

Dr. HOOVER. Yes, sir.

Senator CLEMENTS. I take it that you have carried this experiment along by the use of, you might say, contracted-for equipment, that you feel that you know now what kind of equipment that you should have within your research agency to do a better job than the contract equipment that you have been using?

Dr. HOOVER. That is not exactly correct, sir. What we have done so far is under a memorandum of understanding; the industry is very much interested in such a development.

Senator CLEMENTS. Now you feel that you need equipment of your own?

Dr. HOOVER. But this would be strictly experimental pilot plant equipment.

Senator CLEMENTS. You still have the major problem that is yet a laboratory problem in getting at the chemical analysis, so to speak, of milk itself?

Dr. HOOVER. Right, sir.

Senator CLEMENTS. Which would eliminate the off-flavor that so far we have not been able to avoid?

Dr. HOOVER. That is right, sir.

Senator CLEMENTS. Proceed.

Dr. HOOVER. Next, we will discuss hides.

Since livestock is raised primarily for meat, the supply of hides is fixed by the quantity of livestock slaughtered; that is, hides are a true byproduct.

Within the past 5 years the farm value of hides has dropped under two sledge-hammer blows. One is the annual surplus—some 5½ million hides—resulting from the slaughter of great numbers of cattle for meat.

The other is the shrinkage in the market for leather because of the inroads of substitute materials. Because of these two factors hides now bring less than half the price they brought 5 years ago.

This loss in value totals some $200 million, which is reflected in the prices which would otherwise be received by livestock growers.

Consider shoe soles: Almost two-thirds of our shoes are presently soled with nonleather materials. In addition, nylon, cloth, and plastic materials pose a serious threat to the market for leather used in the uppers. And shoes have been the market for 85 percent of our leather.

To insure that leather retains its place in the sun, the development of new and broader uses is imperative. One promising approach is the chemical modification of hides to make leathers or other hide products with new properties, so as to obtain greater diversity of uses for hides. Another promising approach to the hide problem is the development of better, quicker, and cheaper methods for handling and tanning hides.

One of our goals in chemical modification is a fine light leather which will be washable and hence easy to care for. Ordinary leather is ruined if it is washed in hot water. We have made progress toward a light leather that doesn't care how hot the water is. We treat a hide with a certain resin and make a beautiful white leather that keeps its color.

In very hot water it shrinks, but on cooling, it comes back to its former shape and size. This product may find use in gloves and other specialties.

Another goal of chemical modification is leather that wears better, is waterproof yet permeable, and which keeps its size and shape over a wide range of temperature and humidity.

We have made progress in this direction too, by combining hide with a chemically modified starch. I might say that is the dialdehyde starch of which Dr. Maclay spoke. The product is cheap to make and uses nonstrategic materials.

There is also substantial room for improvement in the current practice of handling hides. For example, packers ship their hides to the tanner in a wet, salted condition. Only about one-fourth of the shipment will appear as leather; the rest is mainly water, salt, and hair, and someone is paying the freight charges on that.

We think it is possible to develop a simple, quick process to remove at the slaughterhouse the material that does not end up in leather, and ship the hide dry. Such a process would mean better sorting and grading. The tanner could buy to better advantage and the producer could expect a greater return for a high quality product. Shipping charges would be reduced.

But to accomplish these goals we need to obtain a lot more information than we have at present. A worthwhile, sustained attack on the chemical modification of hides must be based on knowledge of the chemistry of the hide proteins. This knowledge is the foundation on which we build the know-how. We are gaining the needed information now but we need to get it much, much faster.

We are investigating an enzyme process for removing hair from hide at the slaughterhouse. A good enzyme process would be a big step ahead, because it would solve a stream-pollution problem.

We need to look into new ways of tanning; we have in mind ways that would assist the combination of the hide protein with a variety of chemicals in ways not attainable by the conventional tanning process.

Senator CAPEHART. I want to make a statement which I think is a contribution to this whole problem. That is, here is the concrete example of where the shoe manufacturers and the manufacturers of items that use either leather or substitutes would just as soon use leather as they would substitutes if they could get good leather.

So they would not be harmed in the least, possibly would be helped. Of course, your tanners would tan and handle the processing of all of your hides.

Here is a case, you see, where with the proper research and pilot plants to prove this whole business that you can help the farmer materially, and help particularly the livestock grower.

Here is a concrete example of how everybody would win by the proper research and the proper pilot plants and field tests under this legislation.

Senator CLEMENTS. You would help the record considerably if you would set forth in detail what you mean when you say we are gaining the needed information now but we need to get it much, much faster; if you would just expand on that and tell us what you need to get much faster.

Dr. HOOVER. I mean I am in exactly the same position that Dr. Maclay was. I would say that on this, the basic study of hide protein, we have three people on it.

Senator CAPEHART. Three people?

Dr. HOOVER. We have three people on that program. That is the new program which was established several years ago under increase in funds.

Senator CLEMENTS. What do you need beyond the three people?

Dr. HOOVER. I would like very much to have 20 on that particular phase of it. That is not all of the work.

Senator CLEMENTS. You would like to have 20 people instead of 3?

Dr. HOOVER. That is right.

Senator CLEMENTS. Dr. Hilbert, could you tell us what is in the expansion plan on this 30 percent increase in research funds for this year?

Dr. HILBERT. There is an increase for hides and skins, I believe it is $125,000.

Senator CLEMENTS. How much increase is that—translate that to manpower?

Dr. HILBERT. In manpower that would be an increase of 12 to 14 men.

Senator CLEMENTS. You would be providing 15 to 17 people where Dr. Hoover is suggesting he needs 20?

Dr. HILBERT. That is right. That is on one specific problem.

Senator CLEMENTS. I understand that is what we are referring to now. The manpower question is not completely answered in this, but what do you need in addition to that? Do you need something beyond manpower? Do you need equipment?

Dr. HOOVER. Could I clear up one point first? I was only speaking of the basic work. This work on new types of tannages, chemical modification of hides, each of those programs is approximately the same size. And I believe could well be expanded in the same way.

Senator CLEMENTS. You mean that you have 3 areas of work, they all need to be expanded from somewhere around 3 to 20?

Dr. HOOVER. Yes, sir.

Senator CLEMENTS. And this appropriation bill this year would only take care of approximately a third of your needs?

Dr. HOOVER. That is right.

Senator CLEMENTS. What about equipment—do you need something besides manpower?

Dr. HILBERT. I might explain this, to clarify one point here. There are three different types of research work: Research work in the laboratory, pilot plant work, and then a very costly type of work called developmental work.

In the Department I do not believe we have had authority to undertake to do the developmental type of work.

Senator CLEMENTS. That is exactly the reason I asked Dr. Hoover that question, to make this record as complete as we could so that we would not be basing this upon just generalities, you know, just picked out of the sky. It is easy to make those kinds of statements in a general way but we would like to have something in this record to tie down as many of these particular items as we can.

And certainly, this appeared to me to be one of the best ones they could tie down and provide this committee with just the steps you were proposing to take and what it will cost.

If you would fill that void in this record, Dr. Hoover, and if Dr. Hilbert would join with you, would collaborate in filling that void for us, why I think it would be helpful.

Dr. HOOVER. You would like an additional statement furnished?

Senator CLEMENTS. You could make it orally now, if you so desired.

Dr. HOOVER. If you ask a research supervisor what he could spend if he had it, you will get an ample estimate.

Senator CLEMENTS. That is what I would like. We have opened the box here.

Dr. HOOVER. Drs. Hilbert and Shaw have the job of keeping us all in hand.

Senator CLEMENTS. I think this is an item that we can tie down here that might have considerable effect on all of the other items that may be involved. There would not be time enough for the committee to go into each and every one of these items, but this one you have made it so clear as to what the needs were, I thought probably you were in position to give us manpower needs, as well as equipment needs.

Senator CAPEHART. What is the total volume of the sales to the livestock growers, what we are talking about here, each year?

Dr. HOOVER. At the present time there are roughly 90 million cattle, with an annual slaughter of 27 million, giving this many hides at 60 pounds, which brings you at 12 cents a pound——

Senator CAPEHART. Twenty-seven times sixty?

Senator CLEMENTS. A little over $7 a hide.

Dr. HOOVER. All right.

Senator CLEMENTS. $7.20 a hide.

Senator CAPEHART. Twenty-seven million hides times seven is what?

Dr. HOOVER. Two hundred million.

Senator CLEMENTS. About 200.

Senator CAPEHART. You are talking about——

Senator CLEMENTS. It would be about $200 million.

Senator CAPEHART. You are talking about sales of $200 million that the farmers make each year?

Dr. HOOVER. That is right.

Senator CAPEHART. How much would a private company spend on research to sell more hides and make better hides if they were doing $200 million a year?

Dr. HOOVER. The original figure, I believe, runs 2 to 4 percent in the chemical industry.

Senator CAPEHART. That is what?

Dr. HOOVER. Four to eight million.

Senator CAPEHART. Yes.

Senator CLEMENTS. Let me make this observation to you: I want to get as much information as we can. That information will not help us near as much as to know what they need. And the time is going to run out on us in a very few minutes and this hearing will be over and we will still be looking for information.

Senator CAPEHART. I am considerably disappointed——

Senator CLEMENTS. I think that is important that you get us that information. If you are not in position to give it to us now, why I think you ought to provide it to the committee as to what you need to do this particular job.

Senator CAPEHART. In other words, I am rather disappointed because this legislation has been here since March 22 and here these gentlemen come up with just general statements with no specific information as to what the amount of the cost, the amount of money they would like to have, the amount of manpower—here is an opportunity to get manpower and to get money to do a real job for the American farmer whom they represent in the Department of Agriculture, and all we get here is just statements and generalities about this or that or the other thing, instead of specific amounts that they want.

In fact, so far I haven't found any of these statements which even recommended the passage of the legislation.

Senator CLEMENTS. This is the first time we have gotten down to something that I thought we might be able to tie down.

Senator CAPEHART. I think maybe what we need is some new imagination and new zip and push in the Department of Agriculture. I am frank to tell you that. You give these gentlemen an opportunity to do a job for the American farmer, and the Congress, I think, is willing to do it.

All you get is generalities without any figures.

You had from March 22 to now. And I want to join the able chairman who said this morning when he criticized Mr. Peterson, because he wrote them on March 26, I think——

Senator CLEMENTS. The 22d.

Senator CAPEHART. And gets an answer on July 6.

Senator CLEMENTS. I think it is fair to say——

Senator CAPEHART. I think it is fair to say that somebody has not been on the job.

Senator CLEMENTS. While the Senator from Indiana has made that statement, I want to make this observation for the record: That it was made abundantly clear this morning that there was no statement from the Bureau of the Budget up to the hour of the committee being called to order this morning, and that there was no statement from the Department of Agriculture with reference to the legislation, even though a request had been made on March 22 for their attitude.

It was not made until after the hearings had been announced, that is, on this legislation.

That does not preclude us from getting this information, acting on information that can be made available to this committee.

Senator CAPEHART. I think the record might well show that the committee is certainly having a hard time getting the information. They are not getting, in my opinion, the kind of cooperation they ought to have out of the Department of Agriculture.

Senator CLEMENTS. Dr. Hoover, I think, it is very clear——

Senator CAPEHART. I think we ought to say it, for the best interests of the Congress and this committee.

Senator CLEMENTS. The chairman of this committee would want to say that the statements that have been made by Dr. Hilbert and other members of the Department who operate and speak for the various research groups have been interesting.

Senator CAPEHART. Very interesting.

Senator CLEMENTS. Have been right illuminating and right encouraging.

Senator CAPEHART. Yes.

Senator CLEMENTS. Have been very, very, encouraging to me. They do not do what this committee needs to be done for it to get action at this session of the Congress, because we are not going to get any legislation passed along this line on generalities.

When we go to the floor of the Senate you cannot go there on the basis of generalities. You have got to have something besides sweetness and light and hope.

Senator CAPEHART. Everybody is agreed that we need this sort of thing. We need to find new uses to use up the surplus. We have to have something specific to go on.

Senator CLEMENTS. None of these things are said critically of any one of you, Dr. Hilbert. None of you were in position to act until the Department itself in its top echelon acted. I take it that you are here today due to the fact that you have been called by, I would say, those in the higher echelon of activity in the Department.

Senator CAPEHART. I want to say again—and I have said it over and over again and I will say it today and continue to say it—they have done a remarkable job in these laboratories. They are right now ready, if they can get the money and get the manpower and get the plants—they are ready, they are in position right now to make great progress and put into use, industrial use, in my opinion, new uses for farm products that will use up millions and millions and hundreds of millions of dollars worth of grain, but for some reason, I do not know why it is, we are having trouble getting this whole business off the ground.

I do not know who is responsible for it, but I would say that it is the Secretary of Agriculture. You wrote him a letter on March 22, and he answers you on July 6.

My observation has been that any business, private or government, is no better than the breadth and length of the gentlemen at the head of it.

Senator CLEMENTS. I would want the record to show this, following the statement that was made by the Senator from Indiana, that these hearings might well have been held some time ago if we had had some answer from the Department.

The session was rapidly coming to a close, approaching the close and the hearings were scheduled notwithstanding the fact that the committee had not heard from the Department.

Dr. Hoover, you go on with your statement.

Dr. HILBERT. Mr. Chairman, I have here with me a list of research proposals including research work, pilot-plant work, and development work.

Senator CLEMENTS. Do you have two copies?

Dr. HILBERT. I have just the one with me.

Senator CLEMENTS. I am sorry that we do not have them. Do you have a couple of extra copies?

Dr. HILBERT. We can get them for you.

Senator CLEMENTS. If you have a couple of extra copies you provide one to the Senator from Indiana and provide one to the chairman of this committee, and if this is something you are in position and willing to place in the record, why we will place this in the record at this time.

But then that record may not be available for a day or two. And if a copy could be furnished to the Senator from Indiana and he could get it tomorrow and the chairman of this committee could have it tomorrow, why it would be of some value to them in looking it over, over the weekend.

Could you do that?

Dr. HILBERT. Those are specific research proposals and there are estimates on the cost of each one of those proposals.

Senator CLEMENTS. They can be very important to us.

Dr. HOOVER. The one on hides is $800,000.

Senator CLEMENTS. Why do you not go ahead with your statement?

Dr. HOOVER. Animal fats are another byproduct of the meatpacking industry, whose production is at record levels because of high meat production, and whose once-substantial outlet has been slashed because of competition from synthetic and substitute products made from other raw materials.

Since World War II, synthetic detergents have been taking more and more of the market away from soap. Last year not much more than one-third of the household detergents we used were soaps; the rest were synthetics, most of them based on petroleum, a few on coconut oil.

Of the 3 billion pounds of animal fats we produced last year, only 1.7 billion pounds were used domestically. The rest, fortunately, we were able to export. But the export market is notoriously unreliable and is not a satisfactory answer to the problem.

What we need are diverse outlets for animal fats that will consume large quantites at substantial price levels.

With the encouragement and support of the Livestock Advisory Committee, we have conducted enough research, and achieved a sufficient degree of success, to convince us that there is a tremendous potential market for animal fats in the huge and growing field of plastics, and that in the field of synthetic detergents, we should be able to regain some of our losses to other materials.

The plastic industry produces 1 billion pounds of plastics a year, and is the country's largest user of organic chemicals. It should be an execllent customer for materials made from animal fats.

One of this industry's basic needs is for softeners to make flexible the hard, brittle material from which plastics are made. Softeners may be added to plastics to the extent of 35 to 40 percent.

Animal fats are widely available and are excellent starting materials for the synthesis of softeners. One fat-based material, developed by our laboratories, not only softens the plastic. but makes it resistant to the effects of heat and light.

Most vinyl plastics made today contain this softener to the extent of about 5 percent. Another development of our chemists is a completely new fat-based plastic whose softener is chemically bound to the base material.

This plastic, now being manufactured in pilot-plant quantities, does not become hard and brittle with time and exposure to the weather.

Already 15 to 20 million pounds of animal fats per year go into plastics. This is an encouraging start, but our research should provide far wider uses for fats in this field.

Our plan is to continue making fatty chemicals in the laboratory which should, when combined with existing bases, either lower the cost or improve the properties of the end material.

When we are reasonably sure of the commercial feasibility of their manufacture, we make such materials into actual plastics and determine their physical properties. Most of our materials are modifiers for existing plastic bases, although some, like the one with the chemically bound softener, may be an entirely new type of plastic material.

Among the possible applications for such plastics would be adhesives, protective coatings, flexible and rigid films, and molded products.

Synthetic detergents: In the field of synthetic detergents, we see a good possibility of winning back at least some of the market that today is almost the sole property of the petroleum industry.

Synthetic detergents have wide use, even though soap is the best detergent in soft water. As washing agents, synthetic detergents are effective in very hard water and under other special conditions.

Also, they have many and diverse industrial applications, such as in ore flotation and textile dyeing, where they make effective surface-active agents in water containing acids or metal salts.

There is nothing new about modifying tallow chemically to make a product that will do what soap won't do. Some of the first synthetic detergents were tallow-based, and even today one widely sold commercial product contains a fat-based compound to the extent of about 25 percent of its active ingredient.

Nor is petroleum an inherently better starting material than tallow for detergent manufacture. In our laboratory we have made detergents from animal fats that are as good as, or better than, those made from petroleum.

One large meatpacker is now in pilot-plant production of two fat-based industrial detergents developed by our research. These can be produced quickly and economically, and we hope to see many applications found for them.

But to get wider household use we must improve our present fat-based detergents to make them more soluble, especially in hard water and at lower temperatures. They might be blended with a more soluble detergent, or the tallow might be further modified for better solubility.

When we get better solubility, we can bring the price of fat-based detergents down by diluting them, as other detergents are, with certain sodium salts. Perhaps a combination soap and synthetic detergent can be developed that will not form soap curds in hard water.

These researches should find a solid place for animal fats both in the detergent field—in such products as packaged flakes, granules, powders, liquid detergents, and toil bars—and in the wider industrial field as surface-active agents, such as emulsifiers.

And now let me summarize what I have said about these examples of our research on animal products.

In our attack on the milk problem, we have found out how to make a whole-milk powder which reconstitutes easily to give milk with good flavor. Much more research is needed to find out how to make the powder retain these good properties for a long time on the grocer's shelf, and how to make the powder with methods that industry can use. We believe such a powder will go a long way toward bringing milk consumption and production into better balance.

In our attack on the hide surplus, we have made some encouraging new products. But if we want to be certain that we will break through and win substantial new areas for leather use within a reasonable time, we need to know a great deal more about the chemistry of hide material and about the tanning process. We believe that this new knowledge will lead to much wider use of leather, with resulting increased outlets for hides.

With respect to animal fats, we have already made some headway on using up the surplus. We have new chemicals for plastics, and new detergents, in pilot-plant production. We believe that accelerated research on the use of fats in plastics and in synthetic detergents will lead to greatly expanded markets for animal fats.

Senator CLEMENTS. Dr. Hoover, I am sorry we pushed you along as much as we have, because we know we could have had you for half an afternoon to our benefit.

Dr. HOOVER. Thank you, sir.

Senator CLEMENTS. We will offer the whole thing for the record.

Dr. HILBERT. That is a detailed explanation of each one of those projects, if you care to have that, too.

Senator CLEMENTS. All right. You will give Senator Capehart and myself copies by tomorrow?

Dr. HILBERT. That is right. They are being sent over now.

(The research proposals are as follows:)

STATEMENT FILED BY THE DEPARTMENT OF AGRICULTURE ON RESEARCH PROPOSALS WORTHY OF CONSIDERATION IN THE EVENT A CRASH PROGRAM IS TO BE UNDERTAKEN TO HELP DISPOSE OF AGRICULTURAL SURPLUSES

Priority listing

Priority and title	*Amount*
1. Production of higher quality protein supplements by fermenting cereal grains to produce microbial protein concentrates having high content of the essential amino acids, and development of low-cost processes for making highly desirable feedstuffs from barley	$2,300,000
2. Incorporation of starch into paper and paper products as an extender to meet the Nation's expanding pulp requirements	3,000,000
3. Increased industrial consumption of starch from cereal grains by conversion to oxystarch for production of new industrial products, chemical intermediates, and superior modified starches	2,000,000
4. Production of natural and synthetic rubbers from grain by fermentation and various chemical processing methods	2,500,000
5. Development and testing of methods of production of choice lambs at weaning in Southeastern States to utilize surplus crop acreage	2,000,000
6. Research on cotton and wool to develop (1) radically new machinery and methods for efficient conversion of cotton lint into new and improved fabrics for new specific end uses and markets; (2) new instruments for measuring physical properties of cotton fibers, yarns, and fabrics; (3) chemical treatments which will increase the desirable qualities of cotton products; (4) new textile and nontextile uses for cotton lint including improved nonwoven cotton fabrics and improved cotton-reinforced plastic laminates, and (5) expanded markets for wool by improvement of wool qualities through chemical modification; new wool products with enhanced attractiveness and diverse uses, and more efficient manufacturing processes	5,000,000
7. Development of industrially practicable processes for pulping and use of fibrous plants as replacement crops for grains to extend our domestic sources of newsprint and other paper products, cordage, dissolving pulp for fiber and film manufacture, and building board	1,300,000
8. Production and processing of safflower, flaxseed, and other crops for oil and its chemical conversion into industrial chemicals competitive with synthetic products for resins, protective coatings, elastomers, and lubricants	5,000,000
9. Expansion of research on the development of stable instant dried whole milk, and of low-fat dried milk, that can be readily reconstituted to beverage milk of excellent palatability and high nutritive value	2,600,000
10. Development of methods of raising disease-free poultry which could be processed for extensive export markets and which would provide for utilizations of surplus grains as feed	2,000,000
11. Development of potential new farm crops for drug or specialty purposes, such as production of vegetable tannin, low-cost rotenone, cortison-type drugs and hormones, wax for chewing gum, wax and polish industries, and analgesic and circulatory drugs	2,000,000
12. Research to expand the markets for hides and leathers by development of (1) lower cost tanning processes, (2) washable leathers for use in garments, and (3) leathers with improved resistance to wear and with qualities suitable for new uses	800,000
13. Improvement of methods for meat tenderization, based on expanded studies of the basic physics and chemistry of meat and the engineering development of new techniques, in order to increase the utilization of lower grades of beef	2,000,000
14. Reduction in processing cost of animal products through the development of rapid, semicontinuous, mechano-chemical manufacturing methods	5,000,000

Priority listing—Continued

Priority and title	*Amount*
15. Reduction of the cost of rice and rice products by developing more efficient methods for drying, milling, and processing rice, by lowering the cost of manufacturing rice products, and by increasing the return from low-quality rice and byproducts, in order to improve the position of domestic rice in world markets	$1,000,000
16. Determination of the composition of corn, wheat, sorghum, and other small grains and the properties of the constituents to provide the necessary basis for development of the most efficient utilization and improved processing of these grains for industrial and feed uses	2,000,000
17. Incorporation of wheat grain and wheat flour as binder and filler in hardboard and boxboard utilizing the adhesive properties of both grain and grain products as found or improved by chemical modification	1,000,000
18. Production and development of high-amylose corn as a replacement crop for common corn through research on processing methods for the separation of starch from high-amylose corn and development and evaluation of the starch for industrial uses	500,000
Total	42,000,000

1. TITLE

Production of higher quality protein supplements by fermenting cereal grains to produce microbial protein concentrates having high content of the essential amino acids, and development of low-cost processes for making highly desirable feedstuffs from barley.

ESTIMATED ANNUAL COST, $2,300,000

Problem, need, and value

(1) *Fermentation of cereal grains for higher quality products.*—Research is required to find micro-organisms capable of converting the starch content of grain into protein concentrate high in the essential amino acids—lysine, tryptophane, and methionine—to bring animal rations into more efficient amino acid balance. The protein concentrates made should have 20 percent, or more, of their content in the form of these acids.

Livestock require supplements to make up amino acid deficiencies in grain. The industry would require about 150,000 tons of the amino acids, the production of which would use 150 million bushels of grain. The fermentation proteins would make available needed supplements now obtained mainly from soybean meal and thereby greatly increase the efficiency of grain feed for all livestock. This contribution would (*a*) improve feed efficiency of livestock production about 10 percent, and (*b*) make available additional soybeans for export, the foreign outlets for which have promise. Some subsidy might be required.

(2) *Low-cost processes for making highly desirable feedstuffs from barley.*—Research is needed to develop low-cost ways of removing the fibrous material of the barley husk and of preserving as nearly as possible the protein fraction between the outer husk and the kernel. The high fiber content of the husk limits its use by swine and poultry and requires grinding, milling, or soaking before feeding. Barley tends to produce the much desired, leaner meat-type animal. However, it cannot be readily utilized by farmers despite the real price advantage it has as a locally grown high-carbohydrate feedstuff in sections where corn is not grown.

On January 1, 1956, the Commodity Credit Corporation owned over 30 million bushels of barley with an additional quantity under loan. A 10-percent increase in consumption of barley would remove about 40 million bushels annually from the market, thus relieving the present surplus problem.

2. TITLE

Incorporation of starch into paper and paper products as an extender to meet the Nation's expanding pulp requirements.

ESTIMATED ANNUAL COST, $3,000,000

Problem, need, and value

Research is needed (1) to develop modified starch to serve as an extender of pulp and to improve paper production methods so that increased amounts of starch can be used in sizing and coating of paper to extend pulp supplies, and (2) to produce starch in a form that would replace pulp in part by making starch in fibrous form or having it combine chemically as an integral part of the pulp.

Introduction of starch in amounts of but 2 to 5 percent of the 30 million tons of pulp and paper products used in the United States would require from 40 to 100 million bushels of grain for the starch used. Through large-volume production, starch prices should be low enough to compete with wood pulp at $125 to $150 per ton. The major byproducts of starch production would be oil and protein from corn, and protein from wheat—each of which could be disposed of either on the domestic market or abroad. No subsidy is expected to be necessary on part of the uses. In other cases, dependent upon the quality imparted by the starch replacement, small subsidies might be necessary.

3. TITLE

Increased industrial consumption of starch from cereal grains by conversion to oxystarch for production of new industrial products, chemical intermediates, and superior modified starches.

ESTIMATED ANNUAL COST, $2 MILLION

Problem, need, and value

Research is required to exploit fully the uses of periodate oxidized starch, a starch product now of high potential value because of the recent discovery of an inexpensive production method. Research is also needed to develop large-scale production methods for this new product, for its evaluation as a coating and sizing for textiles and paper, as a tanning agent for leather, as a component of plastics, and to develop polyhydric alcohols, new polymers, and other special industrial products from periodate oxidized starch as a starting material. This new product could consume starch from approximately 10 million bushels of grain each year by replacing (*a*) 25 percent of the 120,000 tons of imported vegetable tannins valued at 25 to 50 cents a pound; (*b*) 10 percent of the billion pounds of polyhydric alcohols derived largely from petroleum sources and valued at 30 cents per pound; and (*c*) 10 percent of the cellulosic, phenolic, and urea-melamine plastics priced at 30 cents per pound; and by extended use of starch in the textile and paper fields. Subsidy would be required in the polyhydric alcohol field unless highly efficient conversion processes could be developed.

4. TITLE

Production of natural and synthetic rubbers from grain by fermentation and various chemical processing methods.

ESTIMATED ANNUAL COST, $2,500,000

Problem, need, and value

Conversion of grain to natural or synthetic-type rubber offers one of the largest potential outlets for surplus grain. The United States imports some 600,000 tons of natural rubber and manufactures over 700,000 tons of elastomers from petroleum products. This total tonnage if produced from grain would be equivalent to between 250 to 300 million bushels. Three methods are known for production of synthetic rubber from grain: (1) Fermentation to ethyl alcohol or butylene glycol and conversion to GRS-rubber; (2) fermentation to itaconic, aconitic, or fumaric acid which can be copolymerized with butadiene to give mixed polyester rubbers similar to GRS-rubber but having qualities fitting them for special uses; and (3) direct fermentation to natural-type rubber by fungi, such as the genus *Lactarius*.

Method (1) has been extensively used and is either marginal or would require subsidy. Methods (2) and (3) are new approaches which could be economical if they yield a maximum of 7 to 8 pounds of rubber per bushel of grain, and if

rubber continues to sell at 30 to 35 cents per pound. Developmental research would be carried out on fermentatiton acids under method (2), which may be specially useful since these intermediate substances cannot now be maintained from petroleum products. Since development of method (3) could possibly revolutionize rubber production, this phase warrants most attention.

5. TITLE

Development and testing of methods of production of choice lambs at weaning in Southeastern States to utilize surplus crop acreage.

ESTIMATED ANNUAL COST, $2 MILLION

Problem, need, and value

Reliable methods need to be developed for the production of choice weaner lambs in the Southeastern States as a source of supplementary income and through use of pasture and forage to replace a portion of the crop acreage now used for cotton, tobacco, and other cash crops presently surplus to current needs. Research must necessarily include (1) disease and parasite studies; (2) research to determine breeds or breed combinations best suited to the area; environmental studies including the use of hormones to induce summer breeding and a high rate of conception at any season; feeding and nutrition research, including especially the utilization and nutritive value of grasses and legumes adapted to the area and productive, in proper succession, throughout the year; and (3) research on supplements, especially locally produced byproduct feed supplements, including peanuts, cowpeas, and cottonseed meals, required for the efficient utilization of weather damaged and other low quality forages, both harvested and in the field.

The 12 Southeastern States contain more than 2 million farms. Most of these farms are small, with an average area of less than 120 acres, and with an average of about 25 acres of crops harvested. These States raise about 11 million acres of cotton and more than 1.5 million acres of tobacco. Restriction of cotton and tobacco acreage poses a very serious problem for the small farmer in finding crops which will produce supplementary income, especially in the livestock field. The production of choice weaner lambs offers such an opportunity. The area is well suited to the production of year round pasture and forage.

The national average consumption of lamb is about 4.5 pounds per capita; that of the 12 Southeastern States, only about 0.7 pound. About 3.5 million lambs would be required to raise consumption of lamb in these 12 Southeastern States to the national average. Such an increase would represent only about 0.75 pound per person on a national basis. The national average consumption of lamb fell from 7.2 pounds per capita in 1945 to 4.5 in 1954.

The 3.5 million additional lambs proposed could be produced on about 1 million acres of the present cropland devoted to cotton and tobacco in these 12 States through the development of highly improved pastures. Gross income from the proposed 3.5 million lambs and the wool from the ewes would amount to about $70 million and net farm income to about $35 million.

6. TITLE

Research on cotton and wool to develop (1) radically new machinery and methods for efficient conversion of cotton lint into new and improved fabrics for new specific end uses and markets; (2) new instruments for measuring physical properties of cotton fibers, yarns, and fabrics; (3) chemical treatments which will increase the desirable qualities of cotton products; (4) new textile and nontextile uses for cotton lint including improved nonwoven cotton fabrics and improved cotton-reinforced plastic laminates; and (5) expanded markets for wool by improvement of wool qualities through chemical modification; new wool products with enhanced attractiveness and diverse uses, and more efficient manufacturing processes.

ESTIMATED ANNUAL COST, $5 MILLION

Problem, need, and value

(1) Cotton, a versatile fiber, once met most textile needs, but is now meeting ever-increasing competition from synthetic fibers. During the past 20 years

synthetic fiber production in this country has increased from 262 million to 1,718 million pounds, an increase equivalent to more than 3½ million bales of cotton. A greatly increased research program on cotton is vital in order to compete with synthetic fibers. It is believed that cotton could reclaim or gain substantial amounts of the present and future fiber market because of its superiority in particular properties.

Reduction in the cost of cotton lint and savings in manufacturing costs are essential to meet competition. These could be effected (1) by development of radically different equipment for effectively cleaning mechanically harvested and other low-grade cottons without loss of spinnable fiber, for cheaply and efficiently spinning cotton, including the very short staples and for high-speed-warp knitting of cotton; and (2) by development of rapid and accurate instruments for measuring the physical properties of cotton fibers and fabrics in order to produce new and improved cotton products, thereby increasing consumer acceptance. New methods and new chemical processes must be found to impart additional desirable properties to cotton. New textile and nontextile uses for cotton lint, including improved nonwoven fabrics and improved cotton reinforced plastic laminates, are needed. The potential market for nonwoven cotton fabrics is large and there is a large-volume potential market for cotton as filler material in the production of low-pressure polyester plastics.

(2) Wool production has fallen from a prewar average of 365 to less than 230 millions pounds (grease basis). It is not a domestic surplus commodity as we import almost two-thirds of our current requirements. However to replace 20 percent of current imports (the initial goal of the National Wool Act of 1954 which is designed to increase domestic production) at least 9 million acres of good grazing land would be needed and could be developed from lands now producing surplus grains. Steadily rising costs of production and processing have contributed to the decline in the domestic crop of shorn wool. Domestic markets could be recaptured through research which would lead to efficient manufacture of new wool products with enhanced attractiveness and more diverse uses.

7. Title

Development of industrially practicable processes for pulping and use of fibrous plants as replacement crops for grains to extend our domestic sources of newprint and other paper products, cordage, dissolving pulp for fiber and film manufacture, and building board.

ESTIMATED ANNUAL COST, $1,300,000

Problem, need, and value

Research is required to develop technical information on processes, products, and potential of fibrous crops, such as timber bamboo, hemp, kenaf, flax, sweetclover, and sericea lespedeza, which can be grown in grain-producing areas, as a source of pulp for newsprint and other paper products. Such fibrous crops would supplement domestic and imported wood pulp for which there is tremendous need. As an example of the need for pulp, the total consumption of paper products in the United States is over 32 million tons. There is also good opportunity for growing crops of special value for cordage and dissolving pulps but although such crops would provide best monetary return, their market potential is relatively small and would not require large acreages for their cultivation.

If fibrous crops could capture 10 percent of the paper market, 3 million tons of pulp would be required, or approximately 7 million tons of fibrous crops. Based on production of fibrous crops of between 2 and 6 tons per acre, 1 to 3.5 million acres of wheatland would be required. Considering $14 per ton now paid for straw going into corrugated paper as a minimum return, the problem lies in getting a fibrous crop that can be processed for commercial use and that will produce enough tons per acre to make it profitable for the farmer to grow.

8. Title

Production and processing of safflower, flaxseed, and other crops for oil and its chemical conversion into industrial chemicals competitive with synthetic products for resins, protective coatings, elastomers, and lubricants.

ESTIMATED ANNUAL COST, $5 MILLION

Problem, need, and value

About 5.5 billion pounds of synthetic organic chemicals are consumed annually in this country. To supply 5 to 10 percent of this potential market with chemical derivatives made from safflower, flaxseed, castor beans, or other oilseed crops would result in the replacement of one to four million acres of grain. Research in both production and utilizatiton of oilseed crops would be required as follows:

Safflower is currently grown on 75,000 acres. Production could be expanded to 1 million acres as a replacement crop but would require development of improved varieties with local adaptations and multiple-disease resistance. If the price of safflower seed were maintained at present levels, $76 to $84 per ton delivered, as an inducement to farmers and some additional milling facilities provided it appears unlikely that other incentives would be required.

Flax: At present there is a surplus of linseed oil. Increased demand for it is dependent largely on development of chemical means of modifying it. Existing varieties of flax should be surveyed to determine the best varieties available for use, adapting them as necessary to the processing techniques evolved in utilization research, and increasing such seed and making it available to farmers.

Castor bean production could be expanded as a replacement for cotton on about 400,000 acres in Oklahoma, Texas, Arkansas, Missouri, and Mississippi, and the irrigated valleys of New Mexico, Arizona, and California. Continued research would be needed to develop improved disease-resistant varieties but the principal production need is for harvesting machinery in order to expand production. A pilot model harvester has been developed and tested for dryland farming of the high plains area for plants up to 6 feet tall and yields up to 1,200 pounds per acre. However, the harvester must be adapted to the higher yielding varieties of the irrigated areas and to the humid region. It would be necessary to develop suitable production harvesters through a negotiated contract with a reliable manufacturer.

Utilization: The oils of safflower, flax, and castor beans are chemically capable of a wide variety of modification reactions, and are accordingly especially promising as raw material for plastics, plasticizers, lubricants, films and other end products of the multibillion pound chemical industry. Castor oil has long since demonstrated its versatility in such uses. Intensive chemical research can extend these widely and develop new chemical outlets also for safflower and linseed oils. Efficient processing methods for safflower, flaxseed, castor beans, and other oilseed crops need to be developed to give highest yields of oil and to produce residual meal of best nutritive value for feed use. Castor meal can be used as fertilizer but not as an animal feed or in preparation of industrial products unless a nontoxic and allergen-free meal can be developed.

9. TITLE

Expansion of research on the development of stable instant dried whole milk, and of low-fat dried milk, that can be readily reconstituted to beverage milk of excellent palatability and high nutritive value.

ESTIMATED ANNUAL COST, $2,600,000

Problem, need, and value

Dried whole milk develops undesirable flavors and decreased dispersibility during storage, primarily because of oxidation or hydrolysis of its constituent fats and changes in the milk proteins. Current studies have produced an experimental product of high quality and ready dispersibility when reconstituted within a short time after drying, but an intensive attack on means of preserving the flavor and physical properties is urgently needed. Solution of this problem is a prerequisite to increased consumption of milk reconstituted from dried whole milk.

Low-fat (10 to 14 percent) dried milk offers a partial solution to the problem, since it has better keeping quality and dispersibility than dried whole milk (26 percent fat). One pound of this product would reconstitute to produce 7 pounds of fluid milk containing 2 percent fat and 11.5 percent nonfat solids. A milk of this composition has a full flavor and excellent nutritional value, due to its high content of protein. This product has interesting possibilities as a new outlet

for surplus milk; however, there would be certain problems having to do largely with changes in dispersibility during storage.

It is estimated that development of a stable dried whole milk could increase the consumption of milk by 2 ounces per capita per day. This is equivalent to 7.3 billion pounds of milk annually, with a value to the farmer of $227 million, based on a value of $3 per hundredweight for manufacturing milk. Similarly, consumption of low-fat dried milk could provide an outlet for an additional 6.4 billion pounds of fluid milk, corresponding to a per capita consumption of 1.8 ounces daily and having a value to the farmer of $192 million.

10. TITLE

Development of method of raising disease-free poultry which could be processed for extensive export markets and which would provide for utilization of surplus grains as feed.

ESTIMATED ANNUAL COST, $2 MILLION

Problem, need, and value

It is estimated that a potential export market for 200 million pounds of poultry, on a ready-to-cook basis, exists in European and South American countries. This estimate is based on exports of an average of 1 pound of poultry per capita per year. Based on a conversion factor of 4 pounds of grain to produce a pound of poultry meat, this potential market could utilize over 13 million bushels of wheat equivalent per year. The possibility of our exporting to these countries has been materially enhanced by the enactment of Public Law 480. There remains, however, the problem of establishing assurance to importing countries that poultry diseases will not be imported with the product.

In the United Kingdom, for example, with a potential market of 75 million pounds, their poultry disease control programs prohibit the importation of poultry meat from areas not free of Newcastle disease. It has been determined by informal conversations that development of a Newcastle disease-free area in this country from which poultry could be exported would lead to consideration of the purchase of United States poultry meat by the United Kingdom.

Research is required to demonstrate whether such a Newcastle disease-free area can be established. Other diseases should be included because there is no assurance that barriers similar to the one against Newcastle disease would not be invoked on chronic respiratory disease and the Salmonella infections.

It would be necessary to select an area with natural or other boundaries which would make quarantine feasible and effective and with sufficient poultry production to supply sizable quantities for export. The area selected would also require full cooperation of the poultry industry and of State livestock sanitary officials, as well as their participation to the fullest possible extent. Maine and New Hampshire or North and South Carolina are potential areas for such trials.

Within the quarantine area it would be necessary to prevent any poultry and poultry products moving into that area, and to vaccinate all poultry with killed Newcastle disease virus vaccine. As that disease is eliminated, the requirements for vaccination would decrease from year to year. It would also be necessary to identify breeding flocks free of chronic respiratory disease, and to replace all infected flocks with disease-free stocks after disinfection of premises, and to identify and eliminate all birds harboring Salmonella infections.

11. TITLE

Development of potential new farm crops for drug or specialty purposes, such as production of vegetable tannin, low-cost rotenone, cortisone-type drugs and hormones, wax for chewing gum, wax and polish industries, and analgesic and circulatory drugs.

ESTIMATED ANNUAL COST, $2 MILLION

Problem, need, and value

In order to realize the most immediate benefits from potential new crops to help promote a more diversified, stable, and profitable agricultural industry, and provide crops to replace those now in surplus, there is need to place under

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preliminary trial production a limited group of plants which have shown the highest potentiality of becoming new crops.

(1) Vegetable tannin: Canaigre is a potential new farm crop which could occupy approximately 100,000 acres in the irrigated valleys of southern Arizona and southern Texas for the production of vegetable tannin. In addition to use as a tanning agent for leather, canaigre offers potentialities for utilization as an effective compound for boilers and in the oil-well-drilling processes. Increased canaigre production would require an increase in suitable planting stock, improved production and harvesting equipment, and the industrial development of processing plants to make the tannin extract.

(2) Low-cost rotenone: *Tephrosia vegelii*, a leguminous plant, has shown much promise in the marginal cotton and peanut areas in Southern United States as a potential new and low-cost rotenone-producing crop. Rotenone is valuable because it creates no hazard to public health when applied to an agricultural crop. The estimated crop production potential is 30,000 to 50,000 acres. Seed production would need to be increased in Puerto Rico by the Federal experiment station there (it does not seed in the United States); sufficient seed for planting 30,000 to 50,000 acres probably could be available by 1958. Additional research information is needed relative to effective production practices.

(3) Cortisone-type drugs and hormones, used in treatment of arthritis, are made from the chemical Diosgenin found in the tubers of the plant Dioscorea (yam). Potentially, the crop could occupy approximately 25,000 acres of the cotton and peanut areas in the lower southern United States. Propagation of the best lines of the plant is necessary in order that commercial nurserymen can build up stock.

(4) Wax for chewing gum, wax and polish industries: Candelilla, a wax-producing shrub, could occupy approximately 50,000 acres of cropland in the Southwest. This plant takes from 2 to 5 years to mature for wax harvest. Seed and rootstock material would need to be selected, the seed propagated, and cultural studies made.

(5) Analgesic and circulatory drugs: Roots of a small shrub, Rauwolfia, are the source of these drugs. This plant could occupy approximately 10,000 acres now devoted to cotton and peanuts on the gulf coast area, excluding Florida. It takes from 3 to 4 years to mature for harvest. Seed would need to be collected and research conducted on cultural practices and adaptability.

12. Title

Research to expand the markets for hides and leathers by development of (1) lower cost tanning processes; (2) washable leathers for use in garments; and (3) leathers with improved resistance to wear and with qualities suitable for new uses.

ESTIMATED ANNUAL COST, $800,000

Problem, need, and value

Recent record livestock numbers and increased slaughter have resulted in an excess of 6 million hides annually over domestic needs. The situation is further aggravated by competition from plastics and substitutes for traditional uses of leather.

This is especially serious in the field of shoe manufacture which once accounted for 85 percent of our domestic leather use. Cheaper synthetic sole materials have replaced over 60 percent of heavy leather requirements for shoe manufacture, while nylon and mylar plastics are making serious inroads into the upper leather market.

The tanning industry is greatly in need of a more economical and rapid process for production of sole leather, based on cheaper tanning and improved leather which could compete more successfully with leather substitutes. A more rapid and cheaper tanning process could result in increased utilization of about 2 million hides annually.

New and broader uses of leather are also imperative. Development of leather with improved resistance to wear, deterioration from polluted atmospheres, and with increased dimensional stability would broaden the utilization of leather as a decorative material for floor tiles and wall coverings and utilize about 500,00 hides per year.

Development of light leathers combining the fine qualities of our present leather with improved workability and ease of care would broaden utilization of leather in the manufacture of clothing and personal articles with increased utilization of about 5 million hides annually.

13. TITLE

Improvement of methods for meat tenderization, based on expanded studies of the basic physics and chemistry of meat and the engineering development of new techniques, in order to increase the utilization of lower grades of beef.

ESTIMATED ANNUAL COST, $2 MILLION

Problem, need, and value

Much of our current beef supply is discriminated against in the market because it is lacking in tenderness. This is the result of many factors, including the poor finish of grass-fed steer, the large surplus of cows, and lack of tenderness of the less-desirable cuts of beef of all classes. Agricultural trends indicate that this condition will become more, rather than less, pronounced.

An expansion of the currently projected program of basic studies of meat physics, chemistry, and biology is needed to permit rapid development of new techniques for meat processing that will result in more tender beef. Such factors as protein structure, protein chemistry, relationship of these to tensile and sheer strength, histochemistry of meat, and microbiological control should be thoroughly investigated. In addition, engineering studies should be employed to translate basic knowledge into processing methods.

If currently marketed lower grade meats were improved through development of methods for meat tenderization, it could be expected to bring such beef into market channels at a price of at least 3 cents a pound higher than at present, with an accompanying return of $1.8 billion annually.

14. TITLE

Reduction in processing cost of animal products through the development of rapid, semicontinuous, mechano-chemical manufacturing methods.

ESTIMATED ANNUAL COST, $5 MILLION

Problem, need, and value

The increasing modern demand is for foods of highest quality and greatest convenience in preparation for the table. If old and new animal products of this kind can be had together with reduced processing costs increased consumption will result. Per capita use of pork products, in recent times, has declined appreciably. Improved ham and bacon products would contribute to reversal of the trend. Better sausage products and precooked dishes would increase demand for cow beef which constitutes 40 percent of our supply. The problem of toughness in frozen poultry is one of major importance to the industry. Costs of cheese production can be reduced by a cent per pound with concomitant improvement in quality and increase of consumption. Improvement in texture and flavor of butter would result in increased sales. Flavored milk products in stable dehydrated form would provide popular new and wholesome beverages. The whole sequence of packing-house operations should be studied intensively to improve quality and reduce cost at many points.

At least 4 pounds of grain are required to produce a pound of meat, and dairy products require a proportionately large intake of feed. Increase in use of meat and dairy foods accordingly contributes not only to alleviation of animal product surpluses but to effective utilization of grains also.

This project would be designed to develop new and attractive animal products and to improve quality and reduce costs throughout the industry.

15. TITLE

Reduction of the cost of rice and rice products by developing more efficient methods for drying, milling, and processing rice, by lowering the cost of manufacturing rice products, and by increasing the return from low-quality rice and byproducts, in order to improve the position of domestic rice in world markets.

ESTIMATED ANNUAL COST, $1 MILLION

Problem, need, and value

Loss of offshore markets, caused by our inability to offer rice at a sufficiently attractive price, is primarily responsible for the present carryover of rice in this country, which has rapidly risen during the past 2 years to approximately

14 million bags, the equivalent of 25 percent of our present annual production. Immediate remedial steps must be taken to recapture and stabilize our offshore outlets for rice, or else some of these markets will be permanently lost.

Cheaper ways must be found for drying, milling, and other processing of rice in order to hold or expand our sales outlets in foreign markets. Our processed rice products need to be further modified to meet the taste and price limitations of offshore consumers. Processing methods now practiced are generally inefficient, resulting in a high direct cost, and an excessive amount of waste and byproducts for which only limited and generally uneconomic uses are known.

Evaluation of basic findings through extensive pilot plant and conclusive commercial adaptation work, costs of drying, milling, and processing rice can be reduced and quality improved. This would assure continuation of our past export business (about 25 percent of the total world trade) and should result in substantial increases. A surplus commodity would thus be eliminated without reducing the current rice acreage (1.8 million), and at the same time the return to growers and processors would be increased.

16. Title

Determination of the composition of corn, wheat, sorghum, and other small grains and the properties of the constituents to provide the necessary basis for development of the most efficient utilization and improved processing of these grains for industrial and feed uses.

ESTIMATED ANNUAL COST, $2,000,000

Problem, need, and value

Increased industrial utilization of starch and protein is a major point of attack on the present surplus of wheat and corn. To provide the information required for the development of new and economical industrial uses for these major components, intensified research is required to elucidate fully their detailed composition, structure, and physical, and chemical properties. Unique properties of these constituents will thereby be recognized which will enable their utilization in end products which make maximum use of these specific characteristics.

Processing of these major constituents leaves the problem of most economical disposal of the byproducts, made up essentially of the minor constitutents of the grain. Attention must be given to composition factors which will enable their most efficient use in feeds and feed supplements. While feed use could probably utilize all of such byproducts, more remunerative outlets would be highly desirable. Hence, study would also be made of the chemical properties and transformation of the minor grain constituents which appear in the byproducts, with the objective of converting them to forms having greater industrial utility and value.

17. Title

Incorporation of wheat grain and wheat flour in hardboard and boxboard as binder and filler utilizing the adhesive propertiess of both grain and grain products as found or improved by chemical modification.

ESTIMATED ANNUAL COST, $1,000,000

Problem, need, and value

Production of hardboard and boxboard in this country requires more than 6 million tons of wood and wood products annually. Potentially, wheat flour or grain might be incorporated in these products to serve as a binder or as a structural element. Developmental research is required to determine the chemical or physical modifications needed for optimal properties of grain or flour in these applications. As a binder in hardboards, unmodified wheat flour at 6 cents per pound would be in competition with synthetic resins at 20 to 40 cents per pound. Replacement of 1 to 5 percent of the weight of these products by wheat or wheat flour would provide a market for about 4 to 20 million bushels of wheat.

Limited experimental work already has indicated that wheat in expanded (puffed) form has special value for use in producing a resin-bonded board which may be competitive with presently marketed coreboard now use in the manu-

facture of furniture, doors, floors, partitions, and the like. This market alone, if completely captured, would consume approximately 15 to 20 million bushels of wheat.

18. TITLE

Production and development of high-amylose corn as a replacement crop for common corn through research on processing methods for the separation of starch from high-amylose corn and development and evaluation of the starch for industrial uses.

ESTIMATED ANNUAL COST, $500,000

Problem, need and value

Corn, which contains a high percentage of an unusual type of starch, called amylose starch, shows promise as a new and unique industrial raw material for conversion into films and fibers or for other purposes. Research is needed to develop starch processing methods and to carry out industrial evaluation of the starch for the production of self-supporting films, fibers, detergent assistants, plastics, superior drilling-mud additives, and special industrial products; also to increase through breeding research the amylose content of high-amylose corn from the present figure of 70 percent up to 80 percent or better, to fit it for a wider range of utility.

High-amylose starch would be generally competitive with dissolving pulp now made from pulpwood. The most promising and perhaps largest potential outlet would be the production of edible films for which there is a large demand in the packaging of food products not now met by any known material. In 1954, 775,000 tons of dissolving wood pulp was produced, selling at from $185 to $225 per ton. Sales of high-amylose starch are expected to reach 20 percent of this figure. This would require 10 million bushels of corn produced on 250,000 acres. It would be wholly used for industrial purposes and, like the waxy corn Tapicorn now grown, which pays the farmer a 12-percent premium over common corn, would bring greater than normal income to the farmer.

Senator CLEMENTS. We will next hear from Dr. Copley, Chief of the Western Utilization Research Branch.

STATEMENT OF DR. M. J. COPLEY, CHIEF, WESTERN UTILIZATION RESEARCH BRANCH, AGRICULTURAL RESEARCH SERVICE, UNITED STATES DEPARTMENT OF AGRICULTURE

Dr. COPLEY. Mr. Chairman and members of the committee, I appreciate the opportunity to describe to you briefly a few of the numerous active and promising research projects engaging the attention of our staff.

The work I shall mention is directed toward solution of the diverse problems that hold back full utilization of such vital agricultural commodities as wool, apples, citrus fruits, potatoes, dry beans, and many other fruit and vegetable crops, the wheats of the Pacific Northwest, sugar beets, Western-grown rice, legume forage crops like alfalfa and the clovers, and poultry and eggs. Significant new leads have recently been opened up in each of these fields.

Our research on wool is aimed at one of the most serious problems in American agriculture; namely, the progressive eclipse of our sheep-raising industry. Production of domestic wool has declined by more than 35 percent from the prewar average. The shift away from sheep raising has been accompanied by conversion of rangelands to cash crops, especially wheat; for example, in Montana alone about 4 million acres of grazing land has been thus released since 1939.

The decline in consumption of wool for garments is worldwide. It has been due in large part to the successful outcome of millions of

dollars worth of research and development on the various new man-made fibers. These have been tailor made by industrial scientists to have various special qualities and advantages.

There is no scientific reason why the wonderful natural fiber, wool, cannot have these qualities built into it if we make a comparable investment of research effort. Our research although conducted on a relatively small scale, has already found important leads toward this objective.

These new discoveries offer the promise of wool fabrics that will require only a minimum of care, so resistant to shrinkage and other defects that garments may be ready to wear after simple home laundering and tumble drying.

In addition, special treatments can make the fiber insect-repellent and able to withstand the acid and alkaline conditions encountered in processing and use. These are some of the special qualities a fabric must possess to be competitive with the synthetics.

Practical attainment of this goal will require a much broader program of research and pilot-scale development than is possible within our present resources.

Even within the area of use still held by wool fiber, American-grown wools suffer under some disadvantages in competition with imported wools, to such an extent that nearly two-thirds of our usage of apparel wool is supplied by the imported fiber.

We have recently discovered a new approach toward solution of one of the most important of these problems, namely, that the imported wools are whiter, on the average, than our domestic wool.

The off colors in our wool, produced by a variety of conditions peculiar to American sheep raising, cannot be bleached out by conventional processes without seriously damaging the fiber.

Our investigations give real hope that processes can be developed that will both bleach successfully and protect the white or pastel-colored fabric from yellowing during use.

Our wool-research program is responsive to urgent needs of the wool industry, as seen by its responsible leaders. Expansion of the work has been urged by the Department's Wool Research and Marketing Advisory Committee, the National Wool Growers Association, and spokesmen for the wool-using industries.

Realization of the promise in our discoveries would quite surely raise the demand for American wool to or above the initial goal of 300 million pounds annually which was established in the National Wool Act of 1954.

The increase above current production levels would require an additional 9 million acres of grazing land, much of it in States where sheep raising is almost the only alternative to wheat production.

Another field of work in which we are making notable progress is the development of new fruit and vegetable products in which excellent flavor, color, and texture are preserved by concentration or complete dehydration.

Basically, the problem toward which this work is directed is the need for expanding markets for fruit and vegetable crops, by overcoming the limitations imposed by extreme perishability and high distribution costs.

The fact is that a substantial part of the price we pay at retail for fresh, canned, or frozen fruits and vegetables has gone into packaging, storing, and transporting plain water.

In some cases as much as 20 tons of water is a deadhead passenger with every ton of actual food substance. Part or all of this water can be removed near the point of origin of the fruit or vegetable.

To find acceptance, however, the new product must be quickly and easily prepared for use by restoration of the water; it must approximate the conventional product in color, flavor, and texture; and it must retain this high quality during storage and distribution. Attainment of these objectives is a difficult technical feat.

Scientists and engineers in our laboratories have accomplished a real technological breakthrough in this field. Dr. Hilbert has mentioned the commercial production of orange juice powder and grapefruit juice powder, made by a process of continuous vacuum drying which we developed.

Tomato juice powder made by a similar process, will be made on a large scale this year. New fruit juice concentrates are being developed from citrus and other tree fruits, berries, and subtropical fruits.

Three new apple products show promise. One is a dry powder made by apple juice by a process of continuous vacuum evaporation; it carries the full apple flavor. Two others, for use in commercial pie baking, are made from apple slices by partial drying to reduce weight and volume and then preserving by canning or freezing.

The "dehydrofrozen" apple slices have been in commercial production in New York State for 2 years. They are economical to package, transport, and store, and bakers find a great advantage in the high, uniform quality they can thus attain throughout the year.

The "dehydrocanned" product, designed for use where frozen storage is not available, is now being evaluated on a semicommercial scale by a packer in the State of Washington.

The "dehydrofreezing" principle is also being used commercially to process pimentoes for use in cheese, where the product has positive advantages of low moisture content and excellent color and flavor, in addition to the economy of packaging and transportation.

Four plants have processed pimentoes for this purpose, total volume last year being more than 3 million pounds of the fresh vegetable. Dehydrofrozen carrots, peas, and celery are being produced on a smaller scale for use in canned soups and other processed food products.

In another recent development, completely dehydrated red sour cherries and peach slices show promise for new export markets because of the large saving in transportation cost, and may also be significant for overseas use by our Armed Forces. These new fields need much more intensive exploitation than we are able to give them.

Research on the utilization of potatoes has the purpose of expanding and stabilizing the market for potatoes by developing a broad range of processed potato products. The desperate need for such a stabilizing effect was demonstrated as recently as 1953, when a crop less than 10 percent larger than that of the previous year glutted the market and the total farm value of the crop was reduced by more than one-half.

There is real hope in increased processing for preventing such gluts, developing export markets, and reversing the trend toward lower per capita consumption of potatoes.

Our research is opening up several promising lines of approach toward this goal. As Dr. Hilbert has told you, dehydrated mashed potatoes, in the form known as "potato granules," have been on the market for several years, and our research has contributed to their success.

An excellent new form known as "potato flakes" has recently been developed. A product like this, easy to store on the shelf and easy to prepare for eating, could bring mashed potatoes back to many a dinner table.

Prepeeled potatoes, frozen french-fries and other potato products, and greatly improved dehydrated potatoes in several forms, along with potato chips and canned potato products, now account for almost 15 percent of our total food use of potatoes.

The frozen french-fries and prepeeled potatoes are experiencing especially rapid development. Our research has played an important role in expanding the use of potatoes in processed forms and we are confident that this development can go much further.

In particular, processed potato products that will keep well even at a high temperature, that are easy to prepare and good to eat, can open up an entirely new export market in the tropical countries where potatoes do not grow well or store satisfactorily. Half the population of the world never sees potatoes in any form. Even a minor development of the market would require more potatoes than the greatest surplus we have ever experienced.

One of our important research projects is devoted to the development and improvement of frozen foods. Food preservation by freezing has now grown to a point where large and important agricultural areas rely on the frozen-food processor as the major purchaser of their produce.

That is the case, for example, in the citrus-fruit area of Florida and in the areas that specialize in raising turkeys or growing strawberries, peas, broccoli, and many other crops. Anything that affects the market for frozen foods affects these growers.

A problem that has caused concern both to these farmers and to the processing and distributing industry is the difficulty of consistently bringing to the consumer's table the highly desirable flavor, texture, and color of excellent fresh produce.

Too often the package of frozen food brought home from the market does not have these attractive qualities, and customers are dissatisfied, perhaps lost.

Our past research on frozen foods has contributed to notable progress toward uniform high qualify in the products, and the public acceptance of frozen foods has continued to grow.

Nevertheless, the industry is still keenly aware that quality defects do appear in its products at the time of purchase, and is convinced that its future growth hangs on finding a solution to this disturbing problem.

The nature of that solution is not immediately apparent. In fact, a great deal of new basic information is needed to guide the rational and economical application of corrective measures.

For several years we have been engaged in a comprehensive investigation of this problem. More than 50,000 packages of frozen foods of many kinds have been studied exhaustively with respect to their behavior under the wide variety of conditions that may be encountered in commercial storage, transportation, and distribution.

Much new knowledge of the kind necessary to meet this challenge has been developed, and practical means for preventing quality losses are being devised. This research is far from being finished. In fact, the frozen-food industry is growing and changing so rapidly that we should be devoting much more attention to this problem than our resources will now permit.

In our research on forage crops, work on improved processing of alfalfa and other legumes led us to make a new study of the composition of these crops. Out of this study have come discoveries which will have most important consequences when fully developed.

Some of the newly recognized constituents turn out to have dramatic physiological effects on animals consuming the forage. Some are advantageous, others are harmful. Once these effects are understood and the substances responsible for them identified the way will be opened for development of greatly expanded acreage of these soil-building crops.

The most dramatic of the effects is the typical bloat produced in cattle or sheep when small doses of some of these compounds are administered. Bloat is one of the most troublesome problems of the livestock raiser.

The value of animals that die from this cause is estimated to be at least $40 million per year, and large additional costs are incurred for treatment of sick animals and for management programs designed to minimize the trouble.

While bloat has long been associated with the grazing of cattle or sheep on alfalfa or clover pastures, the exact cause has been in dispute. Out of our cooperative work with the Animal and Poultry Husbandry Research Branch of the Agricultural Research Service has come strong evidence that the substances known chemically as saponins are in large part responsible.

A big job of research remains to be done to find out which of the several different saponins are responsible for the bloating effect and then devise practical ways to neutralize it or to grow legume forages containing little or no saponin.

We also have evidence that elimination of saponin will overcome an inhibitory effect on the growth of young chicks when very much alfalfa meal is used in the feed. Following the recognition of this growth-depressing effect several years ago the amount of alfalfa used in poultry feeds was greatly reduced.

The reduction in usage actually went beyond what was warranted by the known facts. The alfalfa dehydration industry, which is heavily dependent on this market, has been seriously affected.

We are also finding unsuspected growth-promoting substances in these legume crops, and are actively exploring their identities and effects. Our aim is to find out how to build up and preserve the numerous beneficial substances and eliminate the deleterious ones.

Finally, I shall describe briefly a few of our rapidly advancing lines of research on utilization of poultry and eggs. These farm products find a retail market amounting to over $5 billion per year.

Poultry and egg production is also a potent factor in the utilization of grain; about one-third of all the grain fed to animals is used by the poultry industry. Increase in demand for poultry and eggs would have a real impact on grain surpluses.

We are making progress in developing or improving products with a built-in convenience of use, in assuring the maintenance of high quality during processing and distribution, and in lowering costs by increasing the efficiency of processing methods. Advances along these lines can very promptly stimulate increased demand for poultry and eggs.

In the field of egg products, research conducted some years ago changed the whole picture of egg dehydration for the better, and a solidly based industry has been established.

However, a problem that still limits the usefulness of whole egg and egg yolk powders is that during drying they lose some of their ability to make fluffy cakes and creamy mayonnaise or other salad dressings.

Correction of this defect would permit the introduction of new convenience foods such as a complete sponge cake mix, as well as a more economical ingredient in other baked products and in salad dressings.

Research advances of the past few years have largely solved a similar problem in the drying of egg white. A large new market has resulted from the popularity of angel food cake mixes.

Several possibilities have been found for correcting the deficiencies of dried whole egg and yolk. These include addition of certain edible protective agents before spray drying, the use of edible emulsifiers, and the development of alternative drying methods.

In the poultry meat industry a problem of toughness in some products is causing concern. While "tenderizing" has always been recognized as an essential step in the processing of beef, only recently has serious toughness in frozen young turkeys and chickens been apparent.

The fact that the problem is of recent origin implicates recent changes in processing methods and kitchen practices. Among these changes are the use of higher scalding temperatures, mechanical picking of feathers, reduction in time of holding before freezing, more rapid freezing to insure attractive appearance, and recommendations for cooking the frozen bird without a preliminary thawing and holding period.

Research on this problem has provided important advances in knowledge of the effects of these several factors and has suggested ways to secure improvement. Much remains to be done, however, to accomplish full tenderizing while still retaining the efficiency and sanitary desirability of current operating practices.

Researches on convenient precooked frozen poultry products are developing methods for retaining the desirable freshly cooked quality in these products by solving troublesome flavor and texture problems. If these difficulties can be overcome, the convenience factor is certain to multiply consumption of these products manyfold.

Problems of flavor instability, such as loss of fresh poultry flavor and development of staleness, rancidity, or fishiness, are more serious in cooked than in raw frozen poultry products, and become particularly serious when storage periods are extended and the foods are subjected to relatively high storage temperatures in distribution.

We are studying the conditions under which frozen products such as turkey dinners, turkey pies, and fried chicken develop undesirable flavors. The causes of these flavors and methods of preventing them are being investigated. Promising progress is being made toward the prevention of rancidity.

Texture problems are most apparent in those precooked frozen poultry products that are thickened with starch, flour, or egg. Such products include those containing sauces or gravies, like creamed chicken, a la kings, and chicken pie, and custard and pudding type desserts.

The major change that occurs in these foods during prolonged frozen storage is liquid separation and a curdled appearance after thawing. This change can be retarded in products stored at 0° F. by use of a unique thickening agent, waxy rice flour.

We are now studying the prevention of this kind of change even at the higher temperatures that occur in commercial distribution of frozen foods. Additives such as pectin and gelatin in combination with waxy rice flour show considerable promise of retarding changes under these more severe storage conditions.

Mr. Chairman and members of the committee, I have tried to show you a few examples of the kind of research progress that can mean headline success stories if the work is pushed ahead vigorously.

Basic discoveries about the chemical modification of wool fiber, along with improvements in processing methods, can lead to rejuvenation of a great industry.

The new fruit and vegetable concentrates offer advantages in stability and economy of distribution that can open entirely new markets. New processed forms of potatoes may arrest the decline in consumption and enter exports markets never before tapped.

Improvements in the processing and handling of frozen foods will remove a barrier to further tremendous expansion of this young industry. Alfalfa and clover forage crops, with their great soil-building value, will come into their own when we find out more about their harmful and beneficial constituents and learn how to exploit that knowledge.

New forms of dried eggs and greatly improved frozen poultry products will stimulate a consumer demand that can very quickly create a market for millions of bushels more of the feed grains.

We confidentally believe these great benefits to American agriculture and the American people will be realized if we go after them with resources that measure up to the need and the opportunity.

Senator CLEMENTS. I understand that your needs to do the things that you specified and your summary of what should be done are included in the research proposals that were submitted by Dr. Hilbert earlier.

Dr. COPLEY. I believe that Dr. Hilbert's statement covers not quite all of them. In other words, I believe it covers those referred to as the development of industrial products only.

Senator CLEMENTS. Well, if you have any that are not covered by that statement, I would suggest you make a supplemental statement to this committee, so that we would have it all inclusive.

Dr. COPLEY. Could that be given in written form?

Senator CLEMENTS. Yes, sir. We will give you several days to do it in, but the sooner you do it the better it will be for the committee.

Senator CAPEHART. I think that is exactly what you are looking for. And I think it is very good.

Senator CLEMENTS. I think the detail that was attached to it will be even more important.

Senator CAPEHART. It covers 18 items of $42 million for research on those items. I think it is what we have been looking for all day.

(The information referred to is as follows:

STATEMENT FILED BY THE DEPARTMENT OF AGRICULTURE ON ADDITIONAL RESEARCH PROPOSALS FROM THE PROGRAM OF THE WESTERN UTILIZATION RESEARCH BRANCH

	Amount
Increased research on wheat to expand demand for wheat food products, through development of processes and products that will provide consumers with attractive, flavorful, convenient, and nutritious products at lower cost	$1,500,000
Expansion of domestic and export consumption of fruits and vegetables, and of acreage devoted to these crops, by overcoming extreme perishability and high distribution costs through new and improved processing methods; and developing preservation methods for new fruit and vegetable crops not now widely grown in the United States	2,000,000
Development of poultry and egg products of high quality, great convenience of use, and low cost, thus expanding the demand for and production of poultry and greatly increasing the utilization of surplus grains	2,000,000

Senator CLEMENTS. The next witness we have as scheduled here is Mr. Herschel D. Newsom, Master of the National Grange. Will you come around?

(Senator Scott assumed the Chair.)

Senator SCOTT (presiding). All right, Brother Master, if you will go ahead.

STATEMENT OF HERSCHEL D. NEWSOM, MASTER, NATIONAL GRANGE

Mr. NEWSOM. Inasmuch as you have not been present all day long, it might not be quite so repetitious for you as it would for others, but I can save some time of the committee by saying to you very frankly that we are in vigorous support of Senate bill 3503.

We believe that this sort of vigorous attack on this research problem is long overdue.

As you yourself, Mr. Chairman, so well know, our organization has been instrumental in the creation of the regional laboratories. We were instrumental in the passage of the Research Act some 10 years ago.

For a long time we have consistently sought to get the appropriate kind of emphasis on this matter of utilization of the products of agriculture and development of new products to provide expanded markets.

We are a little bit weary, as you and the other members of this committee know, of what we think is entirely too much emphasis on the idea of too many farmers and too much land in production and too much total production in agriculture.

We think that this approach has been compelled to some extent in these periods of so-called maladjustment which have always followed a war period.

And I think it is appropriate, Senator, that we all recognize the origin of the kind of problem that we have now, because of the basic philosophy back of this legislation that has the endorsement and the cosponsorship of so many of your colleagues.

We have some real enthusiasm about this total philosophy.

Frankly, I think if the rest of American industry had had no more imagination than we have had in agriculture, we might be in a pathetic state of affairs.

More than 50 percent of all American workers in 1955, I am told, were producing commodities that were nonexistent less than 50 years ago. And yet we haven't had that kind of imagination and resourcefulness in agriculture.

That is the kind of thing that this proposed bill seeks to stimulate and to develop.

We do have some basic conflict in our own National Grange policy, with a portion of this bill. I do not think it is too hard for us to reconcile that.

In other words, I am saying to you that if the Congress were to pass this bill exactly as it has been introduced, I believe that we would be very enthusiastic about it.

We would point out, however, that in line with Grange policies we would have to raise some questions about certain of these implementing provisions of the bill.

We might find it desirable to support the keeping of this agency, I say, in line with general Grange policies, within the Department of Agriculture.

And yet when I personally think back over my own short experience of trying to get adequate appropriations or adequate requests for appropriations in the Department of Agriculture budget, it has been a terribly discouraging process. That has been true over a long period of years.

It is not confined to the present administration, or the previous administration. They have all been just about alike on that.

There comes a general request for curtailing the budget and we have to go back over to our friends in Agriculture year after year to seek increased appropriations for this important field of research.

With that in mind, I think that we would be very well pleased if the Congress decided to create this independent agency. I think the bill provides for reasonable coordination of the work of the research administration that is proposed here through the research agency as it is proposed here.

We haven't had an opportunity to study the substitute bill that has been proposed by the Department of Agriculture. But I say to you very frankly that we recognize validity to either side of this argument.

If in the judgment of the Congress it is necessary administratively to keep all of this within the Department of Agriculture, and if the evidence submitted indicates that half of this proposed sum is sufficient for the first year, we will not be totally disappointed.

But if in the judgment of Congress it is administratively feasible to establish the independent administration for research to develop new uses for agricultural crops, chiefly in the field of industry, then we can still do everything within our power to stimulate the present research of the boys that we have been hearing from all day today. That has been enlightening. It points the way to progress.

Goodness knows, there is no excuse for this great Nation of ours standing in 13th place in dairy products consumption among nations. That is where we stood in the last complete figures we had available to us for other nations of the world.

There is no excuse for our standing in fifth place in red meat consumption per capita. Yet that is where we stand.

So the kind of research that these boys have been talking about is tremendously important, but this additional research, this emphasis on markets and on new uses that is envisioned in the bill introduced by our own Hoosier Senator and his colleagues, is the kind of thing that we think reflects the bold, imaginative, and creative thinking we now must have.

The real measure of our ability to improve constantly the living standard of our fellow Americans is whether or not we have the ability and the imagination to use the total productive potential that is ours. That is the way we are going to solve the farm problem in a manner that will be palatable to most of us.

I do not think, Mr. Chairman, there is a bit of point of my taking any more of your time. We will be glad to file the statement for the record, if you want, but that is the way we feel about it.

Senator SCOTT. Your full statement will be inserted in the record at this point.

(The prepared statement of Mr. Newsom is as follows:)

The National Grange appreciates the opportunity to present its views on the value of an accelerated program of research to develop new and additional industrial uses for agricultural products.

We wholeheartedly approve of the purposes of this bill, S. 3503, and we are pleased to notice that such an imposing number of Senators have associated themselves with these purposes. Certainly there should be no disagreement over the very practical value, and need, for concentrating on applied research to expand farm markets.

This bill, in its declarations and findings, is directed toward the overall farm problem in the United States, and to the defense and security of our country.

In this connection, a few remarks about the general farm situation seem to be in order.

Over and over again, in recent months, we have heard various people—experts and otherwise—describe our current farm problem as a case of—

1. Too many farmers
2. Too much land in production
3. Too much production

Surely this is an oversimplification of the situation. There are other factors to be considered—factors which hold out more promise for the future than programs that might be designed primarily to move more farmers off the land, seed more acreage to grass, and cut back the production of food and fiber.

Let's recognize, for example, that our skills and organization for marketing farm commodities have not kept pace with our skills and organizations for production. Let's recognize, also, that we have not concentrated our talents or applied an adequate measure of our resources toward the search for new uses and new markets for farm products.

For the greater part of the past 15 years, American agriculture has been preoccupied with production. Our research efforts, our reseach money, our interests and energy on the farm—were all directed to ways and means of coaxing more production from each animal and each acre.

We were not worried about new uses or new markets. We did not have to "sell." We not only had heavy demands here at home, but obligations to help feed and clothe some of our friends and allies.

So today our agriculture is out of balance. This bill recognizes that we have fallen behind in what must be a relentless effort to develop new and additional uses and forms for farm products in order to build new and wider markets.

Increased consumption of farm products—by industry as well as individuals—is vastly preferable to reduced production.

One of the important and fairly obvious ways of moving toward such increased consumption is along the route indicated by this bill—concentrated research to develop new industrial uses.

S. 3503 would establish in the executive branch of the Government both an industrial Agricultural Products Administration and an Industrial Agricultural Products Agency. The latter agency would become a part of the structure of the Department of Agriculture and its operations would be carried out under direction of the Secretary of Agriculture.

The proposed relationship between the Administration and the Agency is not altogether clear. Neither is there a clear expression of the relative roles of the Administrator of the new Administration, and the Secretary of Agriculture, in the direction and responsibility associated with the proposed research work. These relationships need to be defined more clearly.

We agree, however, that this new undertaking is so vital, and should be carried forward in such a forceful way, as to justify a completely separate identity in the Government structure.

The ability of the Government to attract and keep skilled personnel working on the new research may be the most formidable administrative task ahead. As we understand the situation, competition is exceedingly keen throughout our whole economy for the available supply of trained research men.

In recognition of this situation, we believe there is good reason for the provisions in section 5 of the bill which would authorize the employment of technical or scientific personnel outside the civil-service laws and regulations, and also authorize the employment—or contracting—of individuals, firms, institutions, and organizations, public and private, to engage in the program.

We would urge a reappraisal of the need for an expenditure of $100 million on this program for the current fiscal year. Since much of the effort during the first year would necessarily be confined to organization and the initial steps of the new program, we would roughly estimate that $50 million should be adequate to meet requirements. Experience gained as the program progresses should provide a more accurate gage of the annual fiscal needs for the work. Such experience might show the need for more or less than an annual expenditure of $100 million.

It is pertinent, I believe, to comment here about the relationship of this bill to the provision in the recently enacted farm law calling for establishment of a Commission on Increased Industrial Use of Agricultural products. This Commission is required to prepare and present to Congress, not later than June 15, 1957, its recommendations for action in this field. Thereafter, the Commission will cease to exist.

S. 3503 would speed up this process and would save at least a full year in establishing the organization necessary for proper functioning of the program. This is such a potentially fruitful field, and there is such urgency to provide the benefits of the research to agriculture, that we support the faster, more positive approach of S. 3503.

Over the years, there has been some difficulty on occasions in getting what we considered to be an adequate level of appropriations for agricultural research work. Part of our difficulty, I have come to believe, has arisen from the very diversity of the research projects submitted to Congress for financial support.

Accordingly, I sincerely hope that this program will be authorized with a singleness of purpose that can remain constantly unchallenged—the search for new and additional industrial uses for agricultural products. The constant improvement in the American living standard—in health, well-being and progress of Americans—can be promoted by wise use of all our potential. This objective holds such real promise, and this search is sufficiently important, large, and urgent to stand alone, so that progress and results can be readily appraised.

Again, Mr. Chairman, I thank the committee for this opportunity to appear before it.

Senator CAPEHART. I just want to say, as I did in my opening statement this morning, as the author of this bill I do not care what the personnel consists of, whether it is 2 organizations, whether it is 1, whether it is the Department of Agriculture, all I am interested in is in getting the job done.

And the job is to find new uses and new markets so that we can use up all of the surplus and have a demand for a greater surplus.

Let me say this, the Research Department of the Department of Agriculture—at least, the 4 research laboratories we have had, they have done an excellent job. No question about that with the limited funds they have had. Particularly, the limited number of people.

What we are trying to do in this bill in setting up another administration sort of over them, but operating within the Department of Agriculture, is this: I think any good research man will tell you that he does not want to be bothered with merchandising, does not want to be bothered with pilot plants, particularly, and what is needed is someone that will take the product that these gentlemen have done such a good job of developing, that they have on their shelves now, and build pilot plants and make samples and make field tests, and put the product into production and get manufacturers immediately to start using it.

You have two problems. You have not only the problem of research, but then you have the problem of making that research practical, making it commercially sound and possible to merchandise.

And talking to these big manufactures about getting into the business and selling the processes to the manufacturers, because the bill states that the Government will do the research. And when it is proved practical, they will then turn it over to private industry to produce.

So it requires a lot more than just research, as I see it, having been a manufacturer and salesman and businessman. I want to put zip and pep into this thing. And I want to help these gentlemen who have done such a good job of research, and will continue to do a good job if given the manpower and money and equipment—they need—other organizations beyond that to go out and do what we normally call the handling of the business end.

And your research people will be the first to tell you that is what they need and what they want. Because a man cannot get tied up in research without, you know, he has to lose himself pretty much in research to be a good research man—he just has to think about researching and cannot be thinking about how he will sell it or how he will market it.

There are two parts to this.

One is the research, and the other the development. And then putting it on the market. When you do both of those you will then start using up a lot of the additional farm products.

I do not care how it is handled, so far as that is concerned, as the author of the bill. I want everybody to understand that, I do not care. I want to see imagination and zip and I want to see push. I do not like to see delays like we have had here of 3½ months waiting for the Secretary of Agriculture to answer a letter and to tell this committee and to tell me, as the author of the bill, what he thinks about it.

To me that is entirely too much delay. We ought not to have it.

I don't care. I am trying to do a job for the American farmer, the American people.

Mr. NEWSOM. If I may, I would like to add one more thing. And that is, that this type of delay is typical of the lack of emphasis that we run into for this kind of a program.

Admittedly, this is the kind of program that is going to pay off a long time hence. It has no spectacular appeal for immediate results. That is why we keep putting it off. That is another reason why I think perhaps it may be tremendously important to consider well the possibility of doing everything we can to supplement the present program on the one hand but to do this type of thing under the separate administrative procedure on the other hand.

We must bear in mind, too, that right now we are facing a situation where we need trained researchers to do the basic kind of research that creates the reservoir from which practical research can draw. It is as Vince Cardon, Shaw's predecessor, said one time when I was a member of the General Research Advisory Committee: The trained basic researcher is the scarcest product in the American scene right now.

I daresay, Dr. Shaw, that is still true. That is just another way of emphasizing the necessity of getting on with a vigorous basic research program to go along with the practical research that is presently being done.

In that respect I would like to say that we have supported the Commodity Advisory Committee structure in the Research Administration of the Department. But I have the basic fear that those committees themselves have tended not to overemphasize practical research but to underemphasize the necessity of a long-continuing basic research policy. Unless we are careful, we can run the well of basic research information pretty dry. I suspect that we may have done it already.

Senator SCOTT. In other words, you are saying to us now that so far as the total research picture in industry and agriculture is concerned it is well for agriculture to keep up with the Joneses?

Mr. NEWSOM. Not only well for agriculture but it will supplement the living standards and increase the pace toward increased total prosperity in the country. It is just the American way of doing things.

But we have a well diversified family structure in agriculture that cannot do the type of thing that this legislation proposes. So we must rely upon Government to do it if we are going to have agriculture keeping up with the rest of America.

Senator CAPEHART. Mr. Lynn, of the Farm Bureau, in his statement, said one concern is spending this year $70 million to find synthetic to eliminate the necessity for using cotton.

Just think of that, one concern spending $70 million just to get away from buying cotton. That is what it amounts to. I am not

criticizing them for it. I am just being realistic about it. It gives you some idea of what the poor farmer is up against when he has nobody looking after research for him, other than these 4 laboratories that we have, and we are only giving them $12 million for all research this year. That is in every phase of it. Here is one firm spending $70 million, according to the testimony, just to duplicate cotton.

Senator SCOTT. I do not know what the figure is, but I imagine that it is tremendous what they are spending now on research, not even mentioning the tobacco industry in developing its end product at all.

The papers are full of the development of synthetic tobaccos. We are trying to find out what is in it because I like to use tobacco myself, personally.

Senator CAPEHART. I used my share for 30 years. I smoked 20 cigars a day. I have used my quota.

Senator SCOTT. If you need any more, I can furnish you some.

We are certainly glad to hear from you, Mr. Newsom.

Mr. NEWSOM. Thank you.

Senator SCOTT. Mr. William Rhea Blake is our next witness.

STATEMENT OF WILLIAM RHEA BLAKE, EXECUTIVE VICE PRESIDENT, NATIONAL COTTON COUNCIL

Mr. BLAKE. Mr. Chairman, my name is Rhea Blake, executive vice president of the National Cotton Council, with headquarters at Memphis, Tenn.

Our organization is the industrywide organization, composed of all six branches of the raw-cotton industry; the cotton farmers, ginners, warehousemen, merchants, spinners, and the cottonseed crushers.

The one objective of the Cotton Council, the thing that it was set up for some 18 years ago, is to work at the job of increasing consumption of cotton, cottonseed, and the products thereof, in all of the markets of the world.

Mr. Chairman, there is nothing more basic to increasing consumption than the subject that we are talking about here today—this matter of research.

You increase consumption only by meeting your competition on three fronts: In the matter of price, in the matter of quality, and in the matter of promotion. Research is basic to improvement on all three of these fronts.

There is no satisfactory way that cotton farmers can meet their competition from the price standpoint except to reduce the cost of producing cotton. That is the only way to do it without cutting the farmers' income. And that, of course, is the very opposite of what we are trying to accomplish.

Research, to find out ways and means of reducing cost, is the answer to this matter of being competitive pricewise.

On the second point of quality improvement, there is no way to improve the quality of the cotton fiber or of the products made from the cotton fiber except through research and the application of research findings.

On the third matter of promotion, the basis of any effective promotion program, is, first, a good market research job to find out all of the things pertaining to the market, so you know what to promote and where and how.

Let me say that our organization is very strongly in support of Senator Capehart's bill. We are very strongly in support of his basic objective. I frankly think that we all owe him a great debt of gratitude for the kind of imagination and understanding he has evidenced of what it really takes to get agriculture up on its feet and going like other industries in America.

I think we are deeply indebted to you Senator Capehart, for the kind of dynamics that you have put into this whole picture as a result of your concept that you develop in this bill.

The spirit of this approach is something that is terribly important, in our judgment, and must not be lost if we are going to really realize the full potential of this activity. Not only the spirit of it, but the breadth of the program and the size of it are very important factors.

The fact that you did not set some piddling amount as an increment to the annual research appropriations but instead proposed an increase of $100 million a year, is in itself a recognition of the size and importance of the job to be done and a determination to approach it on an adequate basis.

It is perfectly ridiculous for American agriculture to be neglecting research as it has been neglected for so many, many years. We have never had parity of research with the rest of industry, although 10 years ago the Congress by unanimous vote of both houses passed the Research and Marketing Act of 1946, which recognized that individual farmers could not do their own research and said in the declaration of intent that the objective of that act was to assure agriculture a position in research comparable to that enjoyed by American industry.

And yet for years now, 10 years, this program has dragged along with only very nominal increases. Only in the last couple of years have we had anything like the increases that were envisioned under that program.

Now, this bill proposes to deal with the problem in vigorous terms of increases of $100 million a year. This may sound like a very large amount to some folks, but certainly it is not large when you consider the magnitude of the job we have to do.

On that point, let us just consider one thing: Industry as a whole in this country is spending about 2 percent of its sales on research. Agriculture is spending less than one-half of 1 percent of its sales on research. That figure is based on the farmers receipts of the raw agricultural products. It does not include anything for the added value of the products as they move on up through various stages of processing and manufacturing.

Senator CLEMENTS (presiding). Which is considerable.

Mr. BLAKE. Yes, sir; very considerable.

Well, the percentage would be much, much smaller if you applied the total value of the agricultural products after they reached the point of utilization by consumers.

Let me go back to this appropriation question a minute—this matter of the amount of money actually made available for the program. I certainly hope that we can find some way, Mr. Chairman, if the Congress passes this bill as we hope that it will, to get the appropriations to carry out the program.

I referred to the Research and Marketing Act. It authorized specific increases for 5 years. Over that 5-year period the increments

were supposed to amount to $61 million if I remember correctly. And thereafter, the appropriations were to be in such amounts as the Congress decided was necessary to carry on the program.

Yet we have not been able to get anything like the annual increments that were actually set up specifically in the act.

It will not do us any good to approve this new program and to project the authorizations for it, unless we get the money to carry it out.

I do not know what you can do about that. I realize that the Appropriations Committee has the jurisdiction in that field. First of all, however, we have got to get an administration that will recommend it and a Budget Bureau that will not cut it out of the recommendation. And then a Congress that will appropriate the money.

Senator CLEMENTS. So far as the committee's information goes, it has no recommendation from the Budget Bureau at all.

Mr. BLAKE. I was very happy to hear you say, Mr. Chairman, what you said this morning about the Budget Bureau's attitude. It won't do any good to go through all of the business of passing this bill, if the Budget Bureau is going to put the ax to the appropriation every year and come up with a 10th or a 20th of the amount we are talking about. You just can't do this thing with conversation. We have got to have the money if we are going to accomplish the results.

The money we are talking about is a very, very modest sum compared to the money that we are spending in many different comparable instances that I could give, but I will not take the time to go into it now.

Let me go to the bill itself, to the specific provisions, and say a few words about several of these main points. There has been some discussion here with regard to the administrative set up.

Senator Capehart, I certainly don't want to see the dynamics of this program lost.

Senator CAPEHART. I don't either.

Mr. BLAKE. On the other hand, as one who has been working at this research business in agriculture for a great many years, that is our organization has, we have had a lot of experience with research administration.

Frankly, we have never had the specific question before of a divided research authority with a part of agricultural research going outside of the Department of Agriculture. We have had a lot of experience, Senator Clements, with a division of research responsibility within the Department of Agriculture. And it was not good. We worked very hard over a great many years to try to get the research operations within agriculture consolidated in one place where you could centralize the responsibility and authority to really get things done.

That is now pretty well accomplished. Practically all of the research in agriculture is centered in the Agriculture Research Service.

Senator CLEMENTS. You say you have given a lot of study to that reorganization?

Mr. BLAKE. Yes, sir; I was on the Hoover Commission.

Senator CLEMENTS. You really then, I take it, would like to see research stand alone and get police powers and regulations somewhere besides research?

Mr. BLAKE. Yes, sir.

Senator CLEMENTS. Go right ahead.

Mr. BLAKE. I was on the Hoover Commission task force, the first one that worked on the reorganization of the Department of Agriculture back in 1948. We spent a lot of time studying this whole problem.

We came to the conclusion then that all research ought to be in one place. We made some progress in that direction then. And subsequently there has been more done.

We have gotten better results, Mr. Chairman, much better results, since these research activities have been consolidated.

That makes me fearful, Senator Capehart, about any division. I know it was not your intent that there be any division because, as a businessman, you know the importance of centering authority and responsibility to get results.

I am hopeful that we can work out something that does not lose the spirit and the dynamics of this approach, but at the same time does not do violence to what constitutes good administration, whether it be in the Government or whether it be in private business.

Frankly, we feel that the job should be done by putting the responsibility in the Department of Agriculture, in the Secretary of Agriculture, with the proper sort of changes in organizational setup there to accomplish the objectives of this bill.

Senator CLEMENTS. You favor, then, the proposal at least to that extent which was submitted here this morning for the Department by Secretary Peterson?

Mr. BLAKE. Yes, sir. I think that is preferable. I have great confidence that that can be done without losing the spirit of this proposed program.

Senator CAPEHART. It was primarily for the reason we have been talking here that in 1946 we passed this bill, whereby we had set up these four laboratories and the Agriculture Department really had the responsibility of doing everything that this bill calls for now if not doing, at least recommending it, and it has been their responsibility to look after the farmers and to look after this matter and frankly they haven't done it.

If they will do it in the future I am perfectly happy to have it reside in them. If they will not do it I want to put somebody over them that will do it. I am being perfectly frank in telling you why the bill was written on that basis.

Mr. BLAKE. Let us be real frank about where the trouble has been, Senator Capehart. I think that some of us in this room know where the trouble has been. Here is what happens: The Budget Bureau sends over a budget ceiling for the Department of Agriculture and not only for the Department as a whole, but for each segment of the Department.

And the people in the research end of the Department of Agriculture have to live within that budget ceiling.

Senator CAPEHART. That is right.

Mr. BLAKE. So the trouble has not been in our research administrators in the Department of Agriculture, neither has it been with the Secretary of Agriculture. It has been with the Bureau of the Budget. Although Congress has authorized and given the clear intent that these programs should be built up, the Bureau of the Budget decides for other good and sufficient reasons of its own that they will not be built up, so they are not built up. That is the problem.

What we do about it, I don't know.

Senator CAPEHART. I want to see the head of the Department of Agriculture who will blow the top off of every building around here until the Bureau of Budget does what they should do and what Congress wants them to do, and get this job done for the 5 million American farmers.

And if he will do it, I am happy; but if he won't do it, then I want to put somebody in the status of another Cabinet officer at the White House who will get the job done, meaning a man who will bump heads with the Bureau of Budget or other places and get this job done.

As I said this morning, I am not shooting at anybody. I don't care. I just want to get the job done. I think in getting this job done we are going to have to be very frank and say what we have in our minds just as we have been doing here today.

Mr. BLAKE. I certainly agree with that statement.

On 2 or 3 of these other points, first, the matter of not putting the people that work under this program under civil service.

Of course, I understand the intent of that. It was to get away from the problem of salary limitations that would prevent the administrator from getting the people he has to have if he is going to get the job done. At the same time, the benefits of civil service, especially retirement, are very attractive to many people.

I think that the way to handle this is to put them under civil service and give the Secretary of Agriculture the right to go beyond the salary limits prescribed by civil service, if that be needed to get the right people in particular cases.

With regard to another point, we favor using scholarships and fellowships and contracts to broaden this program. Their use will help provide the additional people needed and will help get this work done in research institutions, public or private, outside of the Federal Government, wherever it can be done best.

We further think that the recommendation of the Department that, in addition to these items, specific grants be also authorized, is very important and should be included.

Senator CLEMENTS. There is before the Congress specific legislation in that field that is not tied to any other particular legislation.

Mr. BLAKE. In the field of what?

Senator CLEMENTS. Training engineers and scientists?

Mr. BLAKE. Yes, sir.

Senator CLEMENTS. The reason I know that is because I am the sponsor of it.

Senator CAPEHART. Which is badly needed.

Mr. BLAKE. It is badly needed, no question on that. Now, one final point: Senator Capehart, you are thinking about industrial uses for farm products primarily because there is more possibility of expansion in industrial uses than there is in the human stomach.

Let us bear in mind that first of all cotton is an industrial raw material. There is no use for cotton that is not an industrial use. So we are starting from that point, insofar as the cotton fiber is concerned.

We do, of course, have some other uses so far as cottonseed products are concerned.

This bill provides primarily for utilization research. And cotton badly needs a great deal more research in this field. However, as I would interpret the bill the way it is drawn, although I am not at all sure that that was the intent, it would be only after the fiber was produced that we could use the provisions of this bill to reduce the cost of its processing and for its product development and to improve the quality of those products.

Senator CAPEHART. That was not the intention. If that is the way it is worded, I will be happy to clarify it.

Mr. BLAKE. The suggestion that we have is that this bill be broadened, if the language is not adequate now, to enable us to also work at cost reduction and quality improvement in producing the fiber itself.

Senator CAPEHART. I think that comes under the bill. If it does not, we ought to change it. Where it says, "To extend existing uses" I think that covers what you are talking about, but if it does not let us get some language that does.

Senator CLEMENTS. I would be very glad if you would want to submit suggested amendments to the bill to carry out what seems to be a very worthy purpose. You can do that at your convenience.

Mr. BLAKE. We will be very happy to do so.

Senator CLEMENTS. I trust at your early convenience.

Mr. BLAKE. We will have it at any time you say. Monday morning, if that is all right.

Actually, we know this for sure: So far as cotton is concerned, if we can bring down our cost we are going to open up markets tremendously.

You see, right now rayon is from 6 to 9 cents a pound cheaper than cotton right here in this domestic market. We have got to get our cost down. And, as we get our cost down, every little bit will widen our markets just that much more.

Senator CAPEHART. That was the purpose of the bill. I think it is covered under extended uses. If it isn't, let us correct it.

That is exactly what we want to do with this bill. We want to find new uses. We want to extend existing uses. We want to find new markets. We want to reduce costs. We want to do all of those things that will make the farmer more prosperous.

Mr. BLAKE. That is fine. And we will try to get some language that we can submit to the committee.

(The proposed amendment is as follows:)

Add a new section to read as follows:

SEC. —. When an agricultural commodity is in competition with a nonagricultural or synthetic commodity for an industrial market, the Secretary is authorized to conduct research on reduction in production costs and quality improvement on the agricultural commodity.

Senator CLEMENTS. I was sorry I was not in here when you opened your testimony, but I will have an opportunity to review it at a later date.

Mr. BLAKE. Thank you very much.

Senator CLEMENTS. Thank you.

Our next witness is John A. Baker, coordinator of the legislative services of the National Farmers Union.

We will be glad to heard from you now, Mr. Baker.

STATEMENT OF JOHN A. BAKER, COORDINATOR OF LEGISLATIVE SERVICES, NATIONAL FARMERS UNION

Mr. BAKER. Mr. Chairman and gentlemen of the committee, I have the honor of appearing here today to present the statement of James G. Patton, president of the National Farmers Union.

Mr. Patton and the Farmers Union helped initiate the legislation of the late 1930's leading to establishment of the regional research laboratories. Mr. Patton played a prominent role in the work that led to the passage of the Research and Marketing Act of 1946.

For many years, Mr. Patton was a member of the top level Research Advisory Committee established by that act. The Farmers Union has always supported expanded agricultural research designed to aid family farms.

Our most recent national convention meeting at Denver, Colo., in March of 1956, adopted the following statement bearing on the matter before the subcommittee.

> We strongly recommend that all areas of expanding demand for farm commodities, consistent with good soil conservation practices, be explored exhaustively before we concern ourselves with production restrictions; but our first concern is that no person lacks the food needed for adequate nutrition.
>
> Therefore, we urge enactment and establishment of a national food allotment stamp plan; a Federal school-lunch and fluid-milk program in every nonprofit school and day nursery; adequate nutritional standards in public institutions; Federal credit to encourage the establishment of efficient terminal markets for perishable farm produce; research and expanded nutritional education programs, and all other workable methods needed to close the gap between what persons can afford to pay for food and fiber products and what they need to maintain an adequate standard of nutrition and well-being.
>
> Additional emphasis should be given to Federal programs to promote greater industrial use of farm commodities not needed to fill food needs. Expanding the demand of this Nation's citizens for farm commodities is a truly national program, not one to be done at the expense of farm family income.

Several points in this statement are pertinent to the bill before your subcommittee.

One, the Farmers Union does not consider the proposal as any one-shot panacea, as a complete substitution for existing farm programs.

Expanded research to develop more industrial uses of farm commodities cannot be satisfactory as a substitute for an adequate farm-income protection and price-support program.

Second, the Farmers Union gives a higher priority to adequate human nutrition and clothing and to soil and water conservation than to expanded industrial uses, when a conflict in aims may occur.

The delegates clearly did not favor farm products for industrial uses to the detriment of good conservation, nor for expansion of industrial uses at the expense of adequate nutrition and clothing for human beings.

Third, the Farmers Union is frankly skeptical that much will be found by research immediately that will provide large, new industrial markets for farm commodities at fair prices to farmers.

With specific reference to the bill, S. 3503, we cannot agree with the last phrase of subsection 1 (b). It is not accurate and should not be given the authenticity of congressional approval.

The same point is equally true of the first clause of subsection 1 (e). This statement is obviously untrue and should not be approved by the

Congress which has only recently adopted the conservation research of the Agricultural Act of 1956.

The same is true of the final infinitive clause of subsection 1 (e).

As was noted in the testimony before the committee earlier today, the Agricultural Research Service of the United States Department of Agriculture has been conducting, rather successfully, considerable research in expanding industrial uses of farm commodities. We have supported this work. But we doubt that newly developed problems in 1956 now justify the establishment of one phase of agricultural research in a new Cabinet ministry outside the Department.

We are, therefore, opposed to sections 3, 4, and 9.

We recommend that appropriated funds support for expanded research in this field of work be made available directly to the existing research agencies of the United States Department of Agriculture, and, through Federal grants, to the State agricultural experiment stations.

These agencies are now fully authorized to conduct this type of research, the proper administrative framework therefor already is established, and highly valuable work of basic importance of further progress in this field now is included in the programs of these Federal and State agencies.

The Farmers Union enthusiastically endorses the proposal of the bill to encourage young scientists through research assistantships. Application of funds in this manner long has been shown to yield large dividends in the immediate accomplishment of productive research work, and in the effective training of young men and women for key positions in programs of research.

Moreover, we note the bill does not recognize the important research and service work of the farmer cooperative service in the Department of Agriculture.

If additional legislation is enacted on this matter, the language should include definite recognition of the industrial-uses research and the adopting of the results of much research by farmers cooperatives.

In fact, we wonder why it is necessary to go this long way around to set up a new Cabinet ministry to do one single phase of farm research. We wonder if doing so does not get the whole matter entirely out of perspective.

One, also, wonders why the executive branch has not already tried to put greater emphasis upon industrial uses of farm products, if it now recognizes the need. Why was this not recommended 2 or 3 years ago?

I hope no one will be misled. Nothing in this bill will do anything to improve farm family income in 1956, in 1957, or in 1958.

We see no great need for a comprehensive big new bill. The Congress only recently adopted, as section 209 of the Agricultural Act of 1946, that which provides for the establishment of an industrial-use commission which is to report in less than a year.

Why this new big push to supplement the customary appropriation process?

We wish to commend the Agricultural Research Service witnesses before your committee for the informative and helpful statement. I was gratified to note Dr. Hilbert's caution that many things that are

chemically or engineeringly possible quite likely may not be economically feasible or financial intelligent.

I note also that Dr. Hilbert's testimony brought out that, in the case of industrial alcohol from corn, it would be feasible only if farmers were willing to sell their corn at 35 cents per bushel.

This figure is at least $1.35 below a fair parity price for corn. This is not to argue against research, but to keep our balance and perspective while we are talking about it.

There is nothing at all in the bill that brings parity to the farmers who may have to sell hogs this fall for $10 to $14 per hundred.

To provide enough incentive to bring farm products into industrial uses with fair returns to farmers would require very large Federal subsidies.

In conclusion, I must mention another danger involved here. This big splurge set out in the bill may itself endanger increased research. We must be careful not to claim too much for expanded outlets through research nor to appear to promise too much for it.

Such research is a slow, careful process. It has undoubted value, and benefits, but it cannot and should not be put forward as a panacea or the complete answer with overnight solutions.

To do so may well set back the cause of true research progress on a stable, long-term basis.

We recommend that your subcommittee draft a revised bill, brought down into proper perspective and balance, incorporating the suggestions we have made in this statement.

We shall be happy to cooperate with the committee staff in this endeavor.

The implication in section 4 of the bill that chemical research is not scientific should be deleted.

Thank you, Mr. Chairman.

Senator CLEMENTS. Thank you, sir.

Next we will hear from Dr. Frankenburg, vice president and director in charge of research and development of General Cigar Co., Lancaster, Pa.

STATEMENT OF DR. WALTER G. FRANKENBURG, VICE PRESIDENT AND DIRECTOR IN CHARGE OF RESEARCH AND DEVELOPMENT, GENERAL CIGAR CO., LANCASTER, PA.

Mr. FRANKENBURG. I shall try to summarize very shortly the ideas I have concerning the proposed bill, S. 3503.

I must say I was extremely pleased when I heard of this bill because I completely concur in the basic philosophy behind the bill, namely, the expenditures for research in such a tremendous field are very small, almost negligible, compared with the expenditures of private industry that it puts into research for new products.

If I now talk about a few points which I would like to say here, then they are from my personal point of view from an experience of about 40 years in industrial research work.

Senator CLEMENTS. You may be certain that your statement in full will be placed in the record.

Dr. FRANKENBURG. Thank you very much, Mr. Chairman.

As far as I can see, there are two main aims which are in the proposed bill.

No. 1, Senator, it calls for a crash program. It seems Senator Capehart feels that certain lines of research which have been followed up by the Department of Agriculture and others are close to the point of realization and are hampered only by the lack of money, may be lack of conviction that these things can be carried through, lack of cooperation with industry in some cases.

I personally think that the gentlemen in the Utilization Branch by themselves were wise when any one of their developments has come to the stage of almost perfection. However, I cannot think such is the spirit of the bill.

With the new vigor shown it will imbue the research units of the Department of Agriculture with help in one or other of the questionable cases to reinforce the feeling that something has to be done fast.

The second aim which has been stressed here a few times, but in my opinion maybe not enough, is the experience in science and in industry generally that it is generally felt sometimes more promising in the long run not to choose direct the technical aim, but to devote enough time to what I would call the control for, namely, basic long-range research. I mention that because there are numerous examples.

I just remember one case, I want to quote shortly. Some 35 years ago I talked with Prof. Otto Hahn in Germany, who at that time complained that his work was so purely theoretical that nobody cared about it.

To make a short statement, well, Professor Hahn some 6 years later in his laboratories led to the split of the uranium 235, and rushed us all into a new age, what we call the era of the atom.

There are many, many other examples which show that the curiosity of the scientist, not dictated primarily by economic factors, can bring really unexpected and new things.

From this point of view, I remember that sometimes in my talks with my friends at that time called Eastern Regional Research Laboratories working in the field of tobacco, it was a little hard to follow the very interesting basic research program because they say now how can we name this program so that it looks like utilization.

I personally was sometimes sorry that such consideration did stand in the way of work which in my opinion in the long run may have brought about unexpected things.

I also was very sorry that some 5 years ago the entire research program on tobacco with which I am, of course, more familiar than with any other program, had to be discontinued and I hope there will be a revival of this program.

Coming to the special field of tobacco, I only want to quote here some figures because there was before some discussion that too few figures are being mentioned.

The total money value of the total tobacco crop grown in recent years in this country amounts to approximately $1.1 billion.

The Federal taxes paid by the manufacturing industry amounts to 1.6 billion. That is in round figures.

If it takes the key which was mentioned before that private industry spends about 2 percent of its sales on research, we would come to the fantastic figure of $22 million to be devoted to tobacco research. I

do know how little has been devoted. In recent years nothing. And that shows the lack and the glaring deficiency of research work as compared with that of industry.

The advantaging of instituting long-range research besides the short-range crash research, would be a very great one, in my opinion.

First of all, there was a talk here about manpower, how many people do you have, "I have 3—maybe I want 20." That does overlook a little bit the quality of the people.

I personally think that a program as conceived in this bill, S. 3503, should be such that it does attract high-caliber scientists. And 1 man might be as good as 10. And I think the choice of the research program, the long-range research looking forward to unexpected new possibilities at the horizon for our agriculture, will work out to the benefit of our farmers, and the industry using agricultural products.

There are possibilities in my opinion for tobacco. First, the extent of its normal use. Tobacco products are still relatively expensive.

I personally think there are ways and means to improve their quality, get them more in the range of customer acceptance.

In addition, there are possibilities of future utilization of the crop. Only so far nicotine from base tobacco has proved to be sound. This is all I wanted to summarize here, Mr. Chairman.

Senator CLEMENTS. Thank you, sir. You have made a definite contribution to the hearing.

Dr. FRANKENBURG. Thank you.

(The prepared statement of Dr. Frankenburg is as follows:)

My name is Walter G. Frankenburg, and I am director in charge of research and development at the General Cigar Co., one of the largest cigar manufacturers of this country. I am an American citizen. Since I was asked to testify here in connection with the proposed bill dealing with scientific research, I assume that you want to have brief information regarding my qualifications for doing that.

Born in Germany, and having served 6 years (including World War I) as an officer in the German Army, I studied chemistry at the University of Munich and was awarded the doctor of philosophy degree summa cum laude in 1922. From 1924 to 1938 I was employed by I. G. Farben Industry, serving as the head of one of its research groups. The work directed by me was devoted to catalysis, photochemistry, and certain aspects of biochemistry, including the technical production of vitamin D and the measurements of ultraviolet radiation and its influence on man. Several new catalytic processes and a new procedure for color photography were worked out in my group. These and other investigations are described in some 45 publications, and were the subject of some 43 patents. After resigning from I. G. Farben Industry, I came to this country in 1939 and joined the Johns Hopkins University as a research associate, where I worked for 2 years on theoretical questions related to surface catalysis. In 1942 I accepted my present position with General Cigar Co. Research Laboratory in Lancaster, Pa., where systematic work was started on the fine details of tobacco chemistry. Together with my associates, we have published some 17 scientific papers covering part of this work, and have filed some 15 patent applications. Besides, I have been acting as a consultant on catalytic questions for Socony-Mobil Oil Laboratories, and since 1947 have worked as a coeditor on Advances in Catalysis. I am the author of 2 books dealing with catalysis. For the research work on tobacco I was honored in 1955 with the annual research award of the Cigar Manufacturers Association of America, and was recently elected a member of the International Commission for Scientific Tobacco Research.

I have studied with great interest the proposed bill, S. 3503, as well as Senator Capehart's comprehensive discussion of this bill as printed in the Congressional Record of March 21 and June 14, 1956. There can be no doubt about the merit of this bill for the farmers, for the manufacturers of goods derived from agricultural sources, and for the consumer. Having been invited to testify here,

I take the liberty of sketching briefly my opinion regarding the proposed research program and its organization.

As far as I can see, two essential purposes will be served by energetic and wise enactment of the proposed bill; namely, (1) to alleviate the present undesirable situation created by the surplus of farm products in this country, (2) to insure for many years to come a steadier and better reward for the American farmer.

As is readily understandable, the focus of interest has been directed, in this forum, mainly toward the first, more pressing of these two purposes—that is toward the partial or complete solution of the urgent problems facing our farmers at this moment. It is significant that the term "crash program" has been used to indicate the speed and efficiency expected from the execution of this part of the bill and it is likewise significant that the subjects listed by Senator Capehart for this phase of the program cover such industrial utilization of farm products as have been studied in the past but only developed to a point at which excessive costs or lack of facilities for pilot plants, or insufficient cooperation between industry and Government research agencies, or other factors have impeded the speedy and energetic pursuit of these developments. No doubt a lively interest of high Government officials in these developments, substantially increased money appropriations, and improved cooperation of the research units with outside laboratories of universities and industries will greatly increase the chances for the rapid development of one or the other potential industrial usages of agricultural crops and livestock. The new vigor that is bound to be instilled by the enactment of this bill into the already existing units of the Department of Agriculture devoted to utilization research, and into the efforts of others working in this field may, within a couple of years, bring about the economically sound perfection of some of the 11 utilizations of farm products enumerated by Senator Capehart before the Senate on March 21.

Coming now to the second field of scientific activity, which in my opinion ought to be entrusted to the new agency. I suggest characterizing this field by the term "long-range research." I may be permitted to dwell on this in a little more detail first because I judge it to be indispensable, extremely important part of the job to be done, and second because its significance, being less obvious to the practical mind, may easily be underestimated. Speaking bluntly, our present knowledge of essential phases of agriculture, particularly of biology and biochemistry of plants, is stil lextremely limited. The exact way in which a growing plant uses the sunlight energy for its own buildup, the importance of soil minerals and soil bacteria for its nutrition and other fundamental aspects of agriculture are insufficiently explored. Furthermore, merely a few of the hundreds of complicated substances contained in a given plant are known to us as a rule. In the past we directed our attention almost exclusively to only those plant constituents which are important for use as food, textiles, etc. We can safely expect that a great number of precious material still slumbers in our crops and in other noncommercially grown plants waiting for their discovery. To unlock this treasure chest, there is no other key than painstaking fundamental research. This means exploring unknown areas. To many people, particularly to the average American with his inborn genius for practical achievements and with his eagerness to get things done in a hurry, this venturing into the unexplored may appear impractical and inefficient. However, the history of science and industry abounds with examples showing that the completely unexpected and seemingly miraculous advances in our knowledge and mastery of nature almost without exception have their roots in fundamental, apparently purely theoretical, investigations. The curiosity of a Galvani, which made him diligently investigate the reasons for the twitching of wire-suspended frog legs some 250 years ago, ushered in the era of the scientific exploration and industrial exploitation of electricity. To mention a more recent example, I remember a chat I had some 35 years ago with Prof. Otto Hahn in Germany. At that time he told me that he sometimes felt a little lonesome and discouraged in doing what he called extremely theoretic studies of the phenomenon of radioactivity. Well, these investigations, in a few years, led to the split of the uranium 235 atom, rushing all of us into what is sometimes called our present atomic era.

Not all fundamental research work leads to such revolutionary results. Nevertheless it is the only proven tool with which to probe deeper into the mysteries of nature. Devoting a certain part, let us say 20 to 30 percent, of the research carried out under the new agency to "long range investigation" will

have the additional advantage of establishing intimate contact with high level research done at universities and elsewhere, and of attracting bright, young scientists whose burning interest is to unveil the secrets of nature. Let us also not forget that future generations may be faced with a scarcity of natural resources such as minerals and oil and have to resort to the growing and utilization of crops as a main source of their livelihood. A proper integration of "long range research" in the program of the new agency will require that the Administrator in charge, besides his qualifications for the "crash program" also have a full understanding of the importance of "long range investigations" and a sound instinct for deciding where and when these investigations can be utilized for the practical aims of the agency.

I would like to add a few remarks concerning the advantages which I would expect from enactment of bill S. 3503 for the special field of tobacco. Important and useful investigations are carried out in a number of experimental stations in the tobacco-growing States of the Union. The primary aim of these stations is to advise and assist the local farmers to study thoroughly the best strains to be grown, the most effective methods of cultivation, curing, new ways of fighting plant diseases and insect pests, and so on. At a few stations, such as the Connecticut Experimental Station, in the field of cigar tobacco additional studies on the chemistry of curing, plant pathology and other topics have been underway for many years, resulting in valuable new knowledge far beyond the limited field of Connecticut tobaccos.

Tobacco research, supported solely by the Federal Government, and directly under the United States Department of Agriculture, is presently carried out at the Agricultural Marketing Service, Marketing Research Division, located in Washington, D. C., and at the Bureau of Plant Industry at Beltsville, Md. The Washington work done in cooperation with laboratories of the cigarette and cigar industries is centered around the problem of expressing the different quality grades of certain tobacco types in terms of their physical characteristics and chemical composition. The work at Beltsville is partly devoted to the extremely important project of developing disease-resistant new tobacco strains of high industrial quality, partly to special problems of tobacco culture, and to detailed investigations of selected sectors of tobacco chemistry.

In the past a third line of tobacco research, directly under the Department of Agriculture, aimed at increased utilization of this crop, had been carried out at the Eastern Regional Research Laboratory in Philadelphia. This work partly directed toward immediate possibilities of utilization, partly to the long range research type, led to very interesting and very promising results. This program was rather suddenly discontinued some 5 years ago, and I want to express here my regret that this took place.

Taken all together, these research activities on tobacco under public administration are, to say the least, extremely modest in view of the importance of tobacco culture in this country. In round figures, the dollar value of the annual tobacco crops grown presently in this country amounts to $1.1 billion, and the Federal taxes paid by the tobacco industry to the Government in the fiscal year 1955 summed up to approximately $1.6 billion.

Considering that progressive industrial companies devote today between 1 to 5 percent of their total sales to research, the funds appropriated by our Government for tobacco research in the past are close to the vanishing point, and this applies particularly to investigations on expanded industrial use of tobacco. Countries with a very much smaller stake in tobacco products, such as France, Germany, Switzerland, and even countries behind the Iron Curtain, support sizable research organizations devoted to this crop, comparable in scope and efficiency to the total Government-sponsored tobacco research in this country.

Faced with this situation, the American tobacco industry had to build up rapidly its own research units. A limited exchange of purely scientific investigation among all the scientific workers in this field was initiated several years ago. In the sector of cigar tobacco, the Cigar Manufacturers Association of America has, for a number of years, supported long-range tobacco research by issuing grants to scientists at universities, and even by financing cooperative agreements with Federal and State laboratories, including the Eastern Utilization Research Branch in Philadelphia, thus attempting to keep alive the previously gathered experience on cigar tobaccos.

You may want me finally to comment on the chances of finding industrial markets for surplus tobacco. Efforts to utilize tobacco for purposes other than smoking and chewing have so far been futile, both in this country and abroad,

except the recovery in waste tobaccos of nicotine as an insecticide. This, however, does not mean that intensified research may not lead, at some future time, to new and completely unexpected utilization of this crop.

In my company's laboratory we have carried out long-range research on cigar tobaccos for a number of years, resulting in the discovery of a series of highly interesting substances in the leaves, and of a number of equally interesting chemical conversions in the leaves. We have just scratched the surface, and I am convinced that more unexpected findings of great scientific and practical importance can be made. These apparently very theoretic investigations led up to substantially improved methods of processing certain tobacco types into a finished product of greatly improved mildness, at reduced cost. Other practical applications appear to be within reach. I would dare to predict that increased usage of cigar tobaccos notwithstanding temporary dislocations, can be expected in the future when extended research permits the industry to put on the market cigars of high quality at prices attractive to the consumer. And, I have no doubt that these chances of increased utilization of cigar tobaccos would be greatly enhanced if the courageous plans outlined in bill S. 3503 would become a reality.

Senator CLEMENTS. The next witness we will have is Dr. Elmer L. Petersen, as representative of the Cigar Manufacturers Association of America.

STATEMENT OF DR. ELMER L. PETERSEN, RESEARCH COMMITTEE, CIGAR MANUFACTURERS ASSOCIATION OF AMERICA, HARTFORD, CONN.

Dr. PETERSEN. As the chairman said, I represent the research committee of the Cigar Manufacturers Association of America today.

The reason we are represented here is because our organization is extremely interested in agricultural research. We have a research committee which is a standing committee of the organization and as evidence of some of our interest in research, we have a man on the Department of Agriculture Tobacco Advisory Committee. And we carry on a tobacco research seminar annually.

We have some grants which we have given to certain research functions in order to study some tobacco research problems. Our thoughts have somewhat paralleled the thinking of the framers of this bill, I believe, in that originally our research was aimed at production research breeding problems and the like and more recently we have gone into basic research which is the type which is pointed up by this bill.

We have studied pigment of tobacco which is basic research and we now have a grant which is being guided by the Eastern Utilization Research Branch at Philadelphia to study the components of smoke.

These are all aimed at trying to improve our product. However, in addition to being strictly cigar people we are very close to the farmer and anything which aids the farmer we are for.

In fact, many of us are farmers ourselves. And we certainly support this bill wholeheartedly.

I would like to summarize a few points.

Senator CLEMENTS. You may be certain that the full statement will appear in the record.

Dr. PETERSEN. Thank you, sir.

It is clear that utilization research of agricultural products holds great promise. Therefore, we believe that the objectives of the bill

(which are spelled out in commendable detail in sections 1 and 2) are extremely desirable.

Concomitantly, we believe that present research facilities will have to be expanded to develop these protentials. Therefore, we believe that the use of present research facilities, both public and private, as well as the development of additional facilities, are desirable. Similarly, the awarding of grants for fellowships and scholarships is necessary if the fullest use is to be made of the Nation's scientific manpower and resources.

Provision for the licensing, at a fair and reasonable royalty, or on a royalty-free basis when this is in the public interest, will assure the most rapid adoption of the processes developed as a result of this research program.

The appropriation of $100 million per year for this type of research program, while large in comparison with past appropriations, is not excessive when compared with the potential benefits to agriculture, and with the savings to taxpayers that may result from the expanded industrial market that will surely be discovered.

It is essential that the administration of this program be directed by highly qualified, technical personnel. Whether a new Government administration or agency is needed, of whether the objectives and functions provided for in the bill could best be encompassed within the existing administrative structure of the Department of Agriculture, we are not prepared to state.

Certainly, however, a program of this magnitude, involving the coordination of many research resources, numerous projects and the Nation's leading scientists, calls for imaginative and resourceful leadership as well as technical competence and administrative ability.

We wholeheartedly approve of the objectives of this bill and are pleased to go on record in favor of it.

Thank you, gentlemen, for your time and courtesy in permitting us to present our views on this matter.

(The prepared statement of Dr. Petersen is as follows:)

My name is Dr. Elmer L. Petersen. I am director of tobacco research of the Consolidated Cigar Corp. I am also a member of the research committee of the Cigar Manufacturers Association of America. In my appearance today I represent this research committee rather than my company.

The Cigar Manufacturers Association of America is a voluntary trade association with members in all major cigar production centers of the country. Our members collectively manufacture approximately three-fourths of all cigars manufactured in the United States. Our association has taken a deep interest in agricultural research. Its research committee is a standing committee of the association because we believe that research in the field of tobacco is basic to the continued progress not only of the industry but of the farmer who produces our raw material. The Cigar Manufacturers Association of America is represented on the Department of Agriculture's Tobacco Advisory Committee. We have participated in the deliberations of that committee and on numerous occasions we have appeared before congressional committees urging support for agricultural research.

Before commenting upon bill S. 3503, I should like to realte some of the research activities of the association, because they illustrate the parallel thoughts of our group with the thoughts of the framers of this bill. Our first interest in research was directed toward tobacco production problems, just as production problems also receive the greatest amount of scientific study in all other agricultural crops. We have conducted an annual cigar tobacco research seminar at which leading scientists have presented the results of their work. However, in addition to

production research we have also had speakers on nonproduction topics such as color and ordor studies. We are actively participating in a cooperative research program through a grant to the Bureau of Plant Industry of the United States Department of Agriculture at Beltsville, Md. This grant is for the purpose of producing disease-resistant cigar wrapper strains of tobacco. This is strictly a production problem.

Our second interest in research was to grant funds to Columbia University for the study of tobacco leaf pigments. This probably parallels some of the more fundamental types of research which are foreseen in this bill. Determination of the leaf pigments may help the industry to produce a more attractive cigar.

Our latest interest in research is strictly basic research which, although not a utilization study, is the type of research necessary if the use of agricultural products in industry is to be increased. A grant has been made for research to be conducted at and to be guided by the Eastern Utilization Research Branch of the United States Department of Agriculture, at Philadelphia, for the study of the chemical components of cigar smoke. It is believed that increased knowledge of the composition of smoke will make it possible to produce cigars which are more desirable to the smoker.

It is natural that our interest in research has been directed toward the production of improved tobacco leaf and cigars. Nevertheless, because of our close association with the farmer we look with favor upon any research which will aid him. Bill S. 3503, with its provisions to inaugurate research, intends to aid the farmer by increasing industrial uses of agricultural products.

To obtain the information necessary for developing new uses for plant products will require a great deal of research. The type of study required must utilize the most modern of techniques and equipment. Although private industry will continue to conduct scientific studies, basic research is too time-consuming and too expensive for industry to explore as thoroughly as necessary. Only a Government research program, involving intensive study of the many crops of American agriculture, can determine the potentialities of each crop, and can develop methods for converting potentialities into realities.

Such a Government program would have two different lines of attack by which to accomplish its purpose. First, it would probably be advantageous for scientists to attempt to develop already known industrial uses which are not being used today because the present processes are too expensive to warrant their commercial use. In research, as in the development of nearly every invention, first methods can always be improved upon. Conesquently it is highly probable that additional research could develop known industrial uses for plant products by concentrating first on improved, commercially feasible methods of production.

The second line of attack is the development of new industrial uses. In order to ascertain new uses for a plant or plant product it is essential to know its composition and the characteristics of its components. It has been established that plants produce hundreds of chemical compounds, many of which are well known, and many of which are known to be present but have not been identified. A basic step, therefore, is further identification of the unknown chemical compounds present in all crops.

We can foresee possible industrial uses for many plant products. For example, industry utilizes many chemical compounds which are derived from oil and coal. These residual products of plants that grew long ago are an irreplaceable source of raw material and energy. Therefore, it seems wise to learn to utilize the chemical compounds of living plants because the plants can continuously resynthesize these compounds for us. Many such industrial uses of plant products have already been discovered, but are awaiting further research to develop commercially feasible volume production methods.

The potentialities of this proposed research program are great because of the marvelous capabilities of plants. They synthesize a great number of complex chemical compounds which are woven into structural units for which we have many uses. These chemical compounds can also be extracted from the plant material and used as raw materials by industry.

Industries already use many plant products, both principal products and byproducts. Certainly an increased use of principal products is most desired, yet an increased use of byproducts could also greatly aid the farmer. The use of sugar cane bagasse by the paper industry, the use of cornstalks for insulating material, the use of corncobs as a source of the industrial chemical compound furfural, and also as a growing medium for mushrooms, are at present among the

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important byproduct sources of income in agriculture. Tobacco byproducts are now used for fertilizer and as a filler dust for insecticides and fungicides, while nicotine is used as an insecticide. Yet the tobacco farmer would be made very happy if uses could be found for presently unused portions of his crop, such as the top leaves and stalks.

From the many chemical analyses which have been performed on the tobacco leaf, we know that it is unique in the production of certain substances. Research might very well find uses for some of these. For example, the gums and resins produced by the tobacco plant might become useful to some industry which uses such compounds in its manufacturing processes. Such a development could be of great value to the tobacco farmer. Similar potentials exist in many other plants waiting for research to find and utilize them.

It is clear that utilization research of agricultural products holds great promise. Therefore, we believe that the objectives of the bill (which are spelled out in commendable detail in secs. 1 and 2) are extremely desirable.

Concomitantly, we believe that present research facilities will have to be expanded to develop these potentials. Therefore we believe that the use of present research facilities, both public and private, as well as the development of additional facilities, are desirable. Similarly, the awarding of grants for fellowships and scholarships is necessary if the fullest use is to be made of the Nation's scientific manpower and resources.

Provision for the licensing, at a fair and reasonable royalty, or on a royalty-free basis when this is in the public interest, will assure the most rapid adoption of the processes developed as a result of this research program.

The appropriation of $100 million per year for this type of research program, while large in comparison with past appropriations, is not excessive when compared with the potential benefits to agriculture, and with the savings to taxpayers that may result from the expanded industrial market that will surely be discovered.

It is essential that the administration of this program be directed by highly qualified, technical personnel. Whether a new Government administration or agency is needed, or whether the objectives and functions provided for in the bill could best be encompassed within the existing administrative structure of the Department of Agriculture, we are not prepared to state. Certainly, however, a program of this magnitude, involving the coordination of many research resources, numerous projects, and the Nation's leading scientists, calls for imaginative and resourceful leadership as well as technical competence and administrative ability.

We wholeheartedly approve of the objectives of this bill and are pleased to go on record in favor of it.

Thank you, gentlemen, for your time and courtesy in permitting us to present our views on this matter.

Senator CLEMENTS. Thank you, Dr. Petersen.

Dr. PETERSEN. Thank you.

Senator CLEMENTS. The next witness is Mr. Stanley F. Reed, president of Reed Research, Inc.

Come around, Mr. Reed.

STATEMENT OF STANLEY F. REED, PRESIDENT, REED RESEARCH, INC.

Mr. REED. Mr. Chairman, Senator Capehart; I have been advocating this kind of legislation for some time.

Senator CLEMENTS. Do you have a prepared statement?

Mr. REED. No, sir.

I run an industrial research laboratory here in Washington. It is of medium size. We do research work for firms such as Du Pont, General Electric, and Bethlehem Steel. A few years ago I became interested in the problem of doing something about these mounting surpluses. As a result I am very much in favor of this legislation as proposed by Senator Capehart. However, there are several things which I think would improve the legislation.

Senator CLEMENTS. The committee would be interested in that and so would the sponsor of the bill.

Senator CAPEHART. I assure you that I will.

Mr. REED. I think the Senator being in industry as I am, and especially being in the electronics business, knows what "feedback" is.

We have "feedback" controls on our economy today, whereby we control the Federal rediscount rate which is designed to prevent a runaway economy.

In this proposed program you should have a "feedback" control where the amount of money that is spent on research is continually tied to the amount of goods that are in surplus. I do not think it should be 50 million or 100 million or 300 million dollars specifically. I think the amount must be geared to the amount of goods in surplus. And the money should be spent on research programs that will create demands for the particular goods that are in surplus. Otherwise, we are going to be spending money trying to grow strawberries on the slopes of Mount Whitney, when we have several billion dollars worth of surplus wheat sitting in our bins.

I feel very strongly about this.

I have seen research program in Government run wild sometimes, without proper controls.

It so happens that the United States Government gives me about $700,000 a year—that is they entrust this amount to my organization for research and development.

About 50 or 60 percent of this is for the Department of Defense.

I think that some of the money spent by the Government research laboratories is misspent because there is not enough control on it. I think that the amount of money appropriated for the purpose of this bill should be controlled by the amount of the goods in surplus and should be spent on research programs on the particular goods that are in surplus.

Senator CAPEHART. What do you mean by "spent on the particular goods that are in surplus"? You mean the amount; you mean percentage of the amount? We have about $9 billion worth of Government surplus. Do you mean a percentage of that?

Mr. REED. Yes, sir.

I think that if you are supporting the price of a commodity that is already in surplus, and support is going to generate more surplus, that you should take a percentage of the support price and put that right back into research to create markets to use up the surplus. This is the "feedback" I referred to.

In this way, you get control of the whole thing.

To be sure, there is a time lag, a dollar spent on research today will create a market maybe 3 years from now.

Senator CAPEHART. One thing that I envision about this whole matter—take on my farm, I grow a lot of corn. It would not make me angry if they came up 5 years from now with a product that I could grow on my farm and make more profit out of it than I could growing corn. I would immediately begin growing it.

The same thing is true here. While there is a surplus of cotton at the moment, I am certain that the cotton farmers would just as soon grow some other product if they could make as much or more money than they can growing cotton.

So I see in this bill that we will try to develop new things. Just as I said this morning, we brought over soybeans from China. As I said, I can remember we did not grow any at all.

We grow new things, that may take the place of the things we are now growing. That is one of the things the fellows in the laboratory will be working on and are now working on.

Senator CLEMENTS. If I understood Mr. Reed—and if I am wrong about it, you can correct me quickly—that your idea was that the greater emphasis should be placed on research in the field where the greatest surplus is existing.

Mr. REED. Yes, sir.

Senator CLEMENTS. Would you not go further and say that the research should be in looking for new usages in areas where you had shortages?

Mr. REED. That is right. I think it should be a dynamic program. One of these gentlemen kept using the word "dynamic." I think you should have a dynamic "feedback" program. Certainly, there is no need to spend this money if there is no surplus.

Senator CLEMENTS. I believe Senator Capehart would say that is a sound premise.

Senator CAPEHART. That is right.

Mr. REED. The second thing is that with Government support of some of these research projects you can run into a very serious patent problem. I have run into this problem with the Department of Agriculture:

Three years ago, more to prove a point than anything else, I went ahead and I made a building board out of puffed wheat, because wheat was a surplus product. It was the work of 3 or 4 months for myself and some of my staff members.

Whether this is a good product or not, I do not know. It certainly is a very unusual product.

Senator CLEMENTS. If I remember correctly, we had one of those boards here before the committee.

Mr. REED. I believe that you did. Immediately, the Department expressed considerable interest. However, they said, "There is nothing that we can do about it because if we should spend any money on that product you personally will benefit because you hold the basic patents."

Well now, under the act which I think established the regional research laboratories authorizing support of outside research under one of their programs, it did not say anything at all to that effect. However, that is now the policy of the Department of Agriculture.

If that should continue to be the policy of the Department of Agriculture, or of this proposed administration you will not get industry cooperation to the extent that might be possible.

In other words, if somebody came in with a good idea, how to utilize another 10, 15, or 20 million bushels of wheat, the Department would immediately say, "If you will give us your patents, then we might do something," but the very minute you state that you own that process, or that it is your idea, the Department states: "We must refuse to spend any money on it, either in our own laboratories or in yours or any place else."

Senator CLEMENTS. That is a delicate situation.

Mr. REED. Very delicate, but it must be resolved.

Senator CLEMENTS. I can see how delicate it would me, because when you spend Federal moneys for something for which a patent should be obtained, certainly that patent belongs to the whole of the people.

Senator CAPEHART. It covers it partially in two points. One is that it says that they shall set up and pay people for bringing them good ideas and developments; and give them awards.

And, secondly, of course, it says that they shall license private industry—license everyone, of course—at a fair royalty, or if they think it is to the best interest of the Nation they can do so without a royalty.

Mr. REED. With this product of mine, what I said to the Department was, "Here, I have done this much—I will get patents on it. You go ahead and set up a research program to further develop this thing. And I believe there will be a market for it."

Any patents which were developed under that program would belong to the United States Government, as they do throughout Government except in defense where the Government receives only a nonexclusive royalty-free license.

I think it is something that could seriously hamper the progress of this idea.

Senator CAPEHART. I think it is well to look into it, I agree with you 100 percent.

Mr. REED. I will submit a draft of proposed changes in section 5 that I believe will eliminate this difficulty. (See attached sheet.) I have very little else to say except that this bill, if it operates the way things like this operate in industry with which I am familiar and with which I am sure that Senator Capehart is familiar, it will go a long way toward stabilizing our agricultural economy.

Whether or not it can be done under the present administrative setup for research in the Department of Agriculture, I do not know. I frankly do not know enough about its top research administration to know whether it is better to have an administrator outside the Department or whether to expand the Department of Agriculture's staff setup.

Senator CLEMENTS. I take it that you would think wherever existing private facilities could be used it would be better than to develop competitive Federal facilities?

Mr. REED. Well, Senator——

Senator CLEMENTS. You still believe in the private enterprise system?

Mr. REED. Yes, sir.

Senator CLEMENTS. When you can get equal results.

Mr. REED. Especially if you have a dynamic "feedback" program where the amount of money changes each year. I do not think you should set up a great Federal research establishment to take care of a surplus problem which may not exist 3 or 4 or 5 years from now.

Senator CLEMENTS. You would want legislation that was broad enough to permit the administrator to do this research on either a contract basis——

Mr. REED. Yes, sir.

Senator CLEMENTS. Or through complete construction through public funds?

Mr. REED. Yes. There is, also, another matter that I think was not adequately treated in the bill. That is the establishment of cooperative or participative research programs between the United States Government and industry. You might get a lot accomplished this way. The United States Government would put up one half and industry put up the other half of the research money. You could generate a lot or programs on utilization of surplus materials this way.

I even suggest that that be investigated in detail because once industry is involved (and those boys are good) if you show them they will possibly make a dollar, they will throw their men into this thing. They woud like to cooperate with Government.

Senator CLEMENTS. You mean that profit incentive still prevails?

Mr. REED. Yes, sir; that is a big thing. You will not get anybody at $50 a day to come to Washington to help get rid of this surplus. Nobody will come.

Senator CAPEHART. Here is what the bill says:

(b) Build, purchase, or lease plant facilities, or necessary equipment, suitable for research, pilot plant, manufacturing or other needs of the Administration in carrying out the purposes of this act.

(c) Employ such personnel as may be necessary to carry out the purposes of this act; and all technical or scientific employees engaged for research by the administration shall be exempt from the civil-service laws and regulations.

(c) Employ or retain on a contract basis individuals, firms, institutions, and organizations, public and private, including land-grant colleges and universities, to conduct research programs for the Administration pursuant to this act.

SEC. 6. The Administration is authorized to pay incentive awards to private citizens for suitable and acceptable suggestions to implement the program established by this act, such payments to be made in accordance with previously published rules stating the amounts of, criteria for determining, and subjects of, such awards.

SEC. 8. The Administration may make grants to accredited schools, colleges, and universities for fellowships and scholarships in research for the purposes of this act.

Senator CLEMENTS. Any further statement?

Senator CAPEHART. I will give consideration to your statement about the patent.

Mr. REED. I think that is important.

(Amendment submitted by Stanley F. Reed, president of Reed Research, Inc.)

INSERTED IN SECTION 5

(e) Anything in this or other Acts to the contrary notwithstanding, prior and related independent research by such individuals, firms, institutions, and organizations, public and private, including land-grant colleges and universities shall not operate to preclude their being employed or retained on a contract basis to conduct new and original research or to continue the prior and related research under the sponsorship of the Administrator pursuant to this Act; nor shall the employment or retention on a contract basis of such individuals, firms, institutions, and organizations, public and private, including land-grant colleges and universities be conditioned on their granting to the Government or any of its departments or agencies any right, title, or interest in any process, machine, or manufacture, or in any patent or application for patent resulting from such prior and related independent research.

Senator CLEMENTS. The next witness is Mr. Walley.

STATEMENT OF ERSEL WALLEY, CHAIRMAN, TRADE USE PROMOTION COMMITTEE, AMERICAN SOYBEAN ASSOCIATION, FORT WAYNE, IND.

Mr. WALLEY. Mr. Chairman, we have a report which is made on behalf of the American Soybean Association, but which is endorsed by the recently formed American Soybean Council. I will submit that for the record with the following notations.

Senator CLEMENTS. That will be placed in the record at this point.

(The prepared statement of Mr. Walley is as follows:)

My name is Ersel Walley and I live in Fort Wayne, Ind. I am appearing on behalf of the American Soybean Association of Hudson, Iowa. This organization represents soybean growers, and has for over 35 years promoted the increased production and utilization of soybeans. This statement bears the endorsement of the recently formed Soybean Council of America and I am authorized to so state by the president of that organization, Mr. Howard L. Roach, of Plainfield, Iowa. Since agriculture is the special concern of this committee, you may be interested to learn that the recently formed Soybean Council of America combines the efforts of the American Soybean Association and all segments of the soybean industry for the purpose of extending the uses of soybeans and promoting both the domestic and export market for soybean and soybean products. The support of this statement by the Soybean Council of America is important in view of the potential effectiveness of this newly formed organization which can be best explained by giving the background of its officers.

Mr. Roach, the president, is a pioneer soybean grower and has for many years been active in processing and utilizing soybeans. He has contributed much of his time and talents to the promotion of soybeans both through work of the American Soybean Association and the National Farm Chemurgic Council. Mr. David G. Wing, of Mechanicsburg, Ohio, who is vice president of the council, is also a pioneer soybean grower and has been active in the work of the American Soybean Association as well as that of the National Farm Chemurgic Council. The secretary of the Soybean Council is Mr. R. G. Houghtlin. Mr. Houghtlin is president of the National Association of Soybean Processors. Mr. Albert Dimond, of Lovington, Ill., treasurer of the council, is the president of the American Soybean Association.

The American Soybean Association in representing American soybean growers, has always, from necessity, been interested in the development of new uses of and enlarging the potential market for all farm products, particularly soybeans. The acreage of soybeans in this country has increased from less than one-half million acres grown for seed in 1926 to what may be as many as nearly 20 million acres grown for seed this year. Stated another way, here is a new crop which today is utilizing 20 or 21 million acres of our best land; acreage which would still otherwise be devoted to the production of other crops, most of which are in surplus. Many long-time soybean growers are apprehensive of the fact that with restrictions on the acreage which may be devoted to wheat, cotton, and corn, soybean production may be increased faster than the market needs.

Selfishly, then, American soybeans growers are interested in every proposal which has for its objective greater utilization of and expanded markets for American farm products. Harking back to the days when we soybean growers gladly traded a ton of soybeans for 1,600 pounds of soybean meal, you can understand why the American Soybean Association has been and is intensely interested in increasing the utilization of farm products.

Having grown soybeans myself continuously since 1922, and having been interested in the work of the American Soybean Association for many years, I personally, at my own expense, spent 3 months in the summer of 1948 in Europe investigating the potential postwar market for soybeans. Since that time others more capable and experienced than I have done wonders in promoting the market for soybeans and soybean products across the Atlantic. Considering the inadequate funds and facilities available for this promotion, the results have been most gratifying and of great value to all American agriculture.

In the past 6 months, the American Soybean Association entered into an agreement with the Foreign Agricultural Service of the USDA to carry out a market-

development program for soybeans in Japan. I was given the privilege of carrying out the first of these projects with a complete exhibit of American soybeans and products made from American soybeans, both by American and Japanese manufacturers at the Japan International Trade Fair at Osaka, Japan, in April. While in Japan, project No. 2 under the agreement with the Foreign Agricultural Service was also initiated. The Japanese-American Soybean Institute was formed, personnel in Japan was employed, and a year's program of intensive market research and sales promotion of soybeans and soybean products was set in motion. The Japanese users of soybeans are enthusiastically cooperating in this program with the American Soybean Association, and we have every reason to believe that this project will be of great benefit to all American agriculture as well as to American soybean growers.

The fact that I am presenting this statement on behalf of the American Soybean Association for our executive secretary, Mr. George M. Strayer, is explained by the fact that Mr. Strayer is now in Europe. He is engaged in making a survey to determine the advisability of entering into a similar agreement with the Foreign Agricultural Service to institute a soybean-market development program in certain European countries. You can be assured that if such a program is entered into it will involve research having to do with the wider utilization of soybeans abroad. This program if undertaken will be financed under Public Law 480 funds as is the program now being carried out in Japan.

This background of our interest in wider utilization and market development of soybeans is given as an evidence of our interest and right to speak on the proposed legislation before your committee. American soybean growers understand thoroughly that the overall agricultural surplus problem is as much their problem as it is that of all other segments of our agriculture. Accordingly, we have given study to the legislation proposed under Senate bill 3503 and hereby endorse the expressed intentions and purposes of the proposed act.

We do not feel that a group such as our is in a position to make recommendations as to the provisions having to do with the administration of the proposed act. We speak only to its purposes.

The prosperity of American agriculture is important in our national economy. Opinions may vary as to the degree of this importance, but it is generally agreed that farm prosperity should be achieved, and that our present farm problem must be solved. Likewise, I believe most people will agree that the best approach to the solution of the problem lies in increasing the utilization of and market for farm products both at home and abroad. Unfortunately agriculture does not have the means of collecting adequate private funds to do the kind of a job and at a rate which the seriousness of the problem demands. We agree that the present situation calls for bold and immediate action and certainly such action is embodied in the bill which you now have under consideration.

With an investment which may or has reached approximately $10 billion under our price-support programs, it would seem that $100 million a year or 1 percent of that investment would not be too much to venture in an attempt to find wider industrial utilization of the products of our farms.

In giving our endorsement to the intent and purpose of this proposed legislation we call the attention of the committee to the fact that the foreign as well as he domestic industrial needs should be explored. We also feel that safeguards should be established so that the program is carried out with the best interests of the farmer constantly in mind. We would regret to see the program result in obtaining a cheap source of raw materials for industry without securing the proper returns for the farmer. This suggestion is based upon our observations that quite often not enough of the benefits of agricultural research in the past have accrued to the benefit of the farmer himself.

We feel that greater utilization by industry of American farm products can be of great benefit to all concerned—industry itself, the general public, as well as the American farmer.

The men who have given so freely of their time and means to carry on the work of the American Soybean Association know, from experience, that increased utilization of farm products is possible. We are not newcomers to this school of thought. We feel that the potential demand for farm products in industry, if properly explored, can do much to strengthen our whole national economy. This confidence is backed by the record of the soybean industry in increasing soybean utilization and markets—domestic and foreign. From less than 5 million bushels in 1925, 49 million bushels in 1935, and 193 million bushels in 1945, we increased our soybean production to 370 million bushels in 1955.

Finding a market for such rapidly increasing production is a tribute to American ingenuity and aggressiveness. May we repeat that we feel that the present agricultural situation deserves bold and immediate action, such as is proposed in this bill.

We appreciate the interest the chairman and members of your committee have shown by holding hearings on this proposed legislation. You can be assured of our full cooperation in whatever form the legislation may take to accomplish the purposes and intentions of this bill. It is the policy of the American Soybean Association to wholeheartedly support all efforts designed to improve our agricultural economy.

Mr. WALLEY. For over 30 years the American Soybean Association has promoted the increased production and utilization of soybeans.

Since 1926, the crop has increased from an annual production of less than 5 million bushels to 370 million bushels in 1955, all utilized and all sold, not given away.

Today, over 21 million acres of good land would be in other crops, mostly in surplus, if soybeans had not been developed.

Industrial utilization results of test tubes, and market development has made this possible.

The American Soybean Association is doing something and has been doing something about it.

We entered into one of the market development programs in Japan. I was given the privilege of setting it up this spring.

Our secretary is now in Europe investigating possibilities there.

I might tell you that in Japan, utilization research is part of the program which we wrote there.

The soybean farmers are apprehensive over the failure to solve the surplus problem. Because after all, the restricted acres from other crops, cotton, corn, wheat, and even tobacco, have been diverted to soybeans. And that means that soybeans to some extent have been the dumping ground for diverted acres. And that means that, also, we must have further utilization and market development in order to prevent finally having an overproduction of the crop.

We are not newcomers to this school of thought of utilization. Soybeans have been built upon industrial utilization as you know.

We do not feel that 1 percent of the investment which Uncle Sam would probably have, up to $10 billion in surplus crops is a very big venture for research.

Therefore, we endorse the intent and purposes of this bill, Senate bill 3503.

We do not presume to speak to the administrative features of the bill, only to the purposes and intents of it.

Thank you.

Senator CLEMENTS. Any questions?

Senator CAPEHART. I do not believe so. Thank you, Mr. Walley.

I just want to say, as he stated, that there is an example of where a farm product has grown into a tremendous income for the American farmers, almost 100 percent used in industry.

Senator CLEMENTS. Depending upon the promptness of receiving the additional information which we will require, I know it will have a great bearing on what we will be able to accomplish with this legislation during the current session. It may be that the Senator from Indiana and the chairman of this subcommittee are overly optimistic about the adjournment date of this Congress, but if we meet what

has been discussed in private as a target date, it is going to be necessary that we move with dispatch in the securing of this information from the Department of Agriculture and further analyzing this testimony.

If there is no one else to appear before the committee, the subcommittee will stand adjourned.

(Whereupon, at 5:35 p. m., the subcommittee adjourned.)

(Additional statement filed for the record is as follows:)

CHICAGO, ILL., *July 17, 1956.*

Senator HOMER CAPEHART,
Senate Office Building,
Washington, D. C.

DEAR SENATOR: I am sorry I was unable to be in Washington during the initial hearings on your bill S. 3503.

Inasmuch as all plantlife has its origin in seed, we are intensely interested in the possibilities that could result from the enactment of legislation such as you have proposed.

I am very much concerned with possible new uses for our present crops but believe greater relief to our Nation's agriculture will come through the discovery of crops not now common to American agriculture. There are in the United States at our plant introduction station thousands of new plants that have not been thoroughly evaluated for their potential industrial uses.

I do not believe we should neglect our crops that are now producing our food, feed, and fiber. We must remember that at one time we were obliged to use from 50 to 60 million acres of land for producing the fuel for the power that operated the equipment on our farms.

Would we not be far better off today if we could find a new crop that would be the source of industrial alcohol at a price that would compete favorably with petroleum products?

What would be wrong with a crop that would be the source of materials to produce rubber since our country is the greatest consumer in the world?

Is it impossible to find a crop that might be the source of a plastic that would have great tensile strength?

There will be those who will say it cannot be done and others who would perhaps not want such developments to become realities. To such doubting Thomases we have but to remind them of the research that made possible the atomic bomb, then the hydrogen bomb, all of which is leading the way to the source of new power which we dared not to dream about a few years ago.

Research can rebuild our Nation's agriculture to the point where production for industrial uses might become a more attractive source of farm income than our present basic crops.

Such a program calls for men with imagination, with vision and technological knowledge and training. They may be hard to find at present but by the enactment of S. 3503 which would provide the facilities and finances needed, men would come forward because of the challenge it offers.

Great care would need to be exercised in the administration of the legislation to prevent it from becoming lost in the great maze of our present Department of Agriculture.

Our present surplus problem arises from the crops our land produces. All these crops come from seed. New crops that may come into the picture in the future will come from seed.

The seed industry will be obliged to make corresponding adjustment. Research must first prove that changes in crops are both practical and profitable. S. 3503 can lead the way.

Additional copies of this statement can be furnished.

Very truly yours,

AMERICAN SEED TRADE ASSOCIATION,
WILLIAM HECKENDORN,
Executive Secretary.

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